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EDITORIAL NOTES.

Hygienic and Heating Efficiency of Gas-Fires.

WE have no desire to appear in any way to have a leaning in any controversy between the manufacturers of gas-fires; and to the present time, we think it may be claimed that any intervention on our part has been either in the interests of scientific truth or of equity. An article that appears in other columns, from the pen of Mr. H. James Yates, entitled "Criticisms of Recent Proposals Concerning Gas-Fire Construction," protects us from any charge of bias, in view of the fact that the sole and confessed intention of Mr. Yates's article is to assist scientific truth to prevail. That is also the object of the present article, and previous ones that have appeared, and for which there has been editorial responsibility. No good will be served by beating about the bush. The article now before us arises from the introduction of the "Shadowgraph" system of testing gas-fires introduced by the Davis Gas-Stove Company, the interests of which Company are no more to us than those of any other gas-fire enterprise. What does concern us and our readers is any advance, actual or promising, that that Company or any other may make. But we cannot allow Mr. Yates's article to appear in our columns without reference to one statement that is outside the purely scientific question claiming particular notice. The statement, which is in the final paragraph of the article, is this: "The present controversy was not of our seeking, but was forced upon us by the repeated challenges made to us by the firm in question, and also by the fact that they have at demonstrations, given by them throughout the country, systematically used our fires as examples of improper construction." Let us refresh Mr. Yates's memory regarding a statement for which his firm were responsible, and which appeared in the "JOURNAL" for Sept. 3 last. It reads:

> The temptation, they [Messrs. John Wright and Co.] tell us, to adopt "picturesque, empirical methods of testing has been steadily resisted and carefully avoided by them; and, on the other hand, the greatest care has been taken in construction to avoid the danger into which less perfect experience would not unnaturally hurry anyone—of effecting the complete removal of the combustion products by means such as would with any normal chimney—*i.e.*, one having no down-draught—remove not the products only, but much valuable heat also." A fire, for instance, that carries off all its products without being attached to a flue will, the firm submits, when the ordinary chimney draught comes into play, "inevitably carry off more than the products—to wit, an unnecessary number of heat units as well; and a lowered room-heating efficiency is the result."

The article from which this extract is made was published shortly after the "Shadowgraph" system of testing for hygienic efficiency had been introduced to the gas industry through our columns; and therefore we do think that instead of writing: "The present controversy was not of our seeking," Mr. Yates might have taken upon himself a fair amount of the share—perhaps the lion's share—for initiating it, and not repudiating it as he now does. But let that pass. The "picturesque" "Shadowgraph" system has since been under the careful investigation—an investigation made with primary and secondary testings, in order to check the findings—of Mr. W. J. A. Butterfield; and the system has had its position as a useful and quick means of testing for hygienic efficiency fully established. There is the second point. We have not been at a single demonstration in the country of the "Shadowgraph" system, outside private laboratory investigations; so that we cannot speak as to the systematic public use of Messrs. Wright and Co.'s gas-fires as examples of improper construction. But let us turn back as far as Oct. 22 last; and there, in a postscript to a letter (p. 299) by the Davis Gas-Stove Company, reference is made to a circular-letter, dated Sept. 19, which had been distributed by Messrs. Wright among gas undertakings, and in which, the postscript said, "they obviously endeavour to ridicule the 'Shadowgraph' method of testing, without showing any foundation for the attitude taken up. In that circular-letter, they also repeat the statement which originated this correspondence, and which we have challenged them—and challenged them in vain—to prove." That circular (a copy of which was seen by us), we repeat, was dated Sept. 19; and, so far as we are aware, at that date demonstrations of the new testing method before gas officials and gas-fitting staffs had not been made up and down the country. The purely trading differences of firms are no concern of ours; but it is only fair, as we are under pledge to allow the article by Mr. Yates to appear as he sent it, that these points should be made, hinging as they do upon the physical matter at issue, and upon the question of relative responsibility for the credit of bringing this matter forward, which Mr. Yates apparently now disclaims.

But we will leave that for the more useful, but, when the conditions are taken fully into consideration, probably not (without it is supplemented) more convincing, part of the article. Let us again remind readers of the original submission of Mr. Yates: "A fire, for instance, that carries off all its products *without* being attached to a flue will, when the *ordinary* chimney draught comes into play, inevitably carry off more than the products—to wit, an unnecessary number of heat units as well, and a lowered room-heating efficiency is the result." This assertion was made nearly eight months ago. It appears that the reason there has not been earlier reply to the challenge for proofs is because Mr. Yates desired to have the confirmation of an independent and impartial observer; and he has submitted certain matters to the investigation and report of Professor W. A. Bone. Neither, however, in the article, nor in Professor Bone's written opinion (which is only dated the 19th ult.), are any details given regarding the nature of the investigation he made, or the precise numerical results he obtained, nor are the conditions described under which the tests were conducted. While not for a moment questioning the accuracy of Professor Bone's report on the matter as submitted to him, the absence of any details wholly prevents another qualified investigator from carefully carrying out similar tests, under like conditions, in order to see whether, and to what extent, he obtains confirmation of, or variation from, the tests made by Professor Bone. When Mr. Butterfield investigated the "Shadowgraph" system, he did not merely pronounce an opinion upon it; but, step by step, he gave the technical world an account of the investigation and the results, so that all who cared to do so could check his findings. We have not the slightest doubt that, if Messrs. Wright and Co. ask him, Professor Bone would be perfectly willing to have the complete details published, in order that the firm chiefly concerned could have, in justice to their own interests, exactly corresponding tests made by (say) Mr. Butterfield. The gas industry, we are sure, will hope to see this done on the principle of *audi alteram partem*.

It is not at all clear whether the issue that was submitted to Professor Bone was precisely the one presented in our last quotation, and which was the real original point at issue—that is to say, whether, although a somewhat lower canopy may be used in one instance than another, a greater quantity of heat units will be carried away by the ordinary chimney draught in the case of a fire without a flue-pipe than would be carried away, in the case of another fire, by the ordinary chimney draught *plus* the additional pull exercised by a flue-pipe. This is the point pure and simple. Was it submitted to Professor Bone in this particular form? We ask the question because, if the words of the guarded opinion of Professor Bone have their literal meaning attached to them in relation to the simple proposition as presented above (without any question as to whether or not flue-pipes are desirable, or as to whether the shorter the length of flue-pipe a fire requires the better), then his opinion as it stands does not support the declaration that originated the dispute. What does Professor Bone say: "I found that, in the case

"of *both* fires tested, *an increase in the ventilating effect* was "only gained at a certain sacrifice of radiant efficiency, "which sacrifice was more marked the less the distance "between the lower edge of the canopy and the top of the "radiants." Just so! The first part of this opinion is the whole point. Where there is sufficient "ventilating effect," there is no need to increase it. If, however, a fire requires "ventilating effect" increased by the use of (say, for argument) 3 feet of flue-pipe to overcome the volume of products of combustion that would otherwise escape from beneath the canopy, it can well be understood that this could only be secured by a "certain sacrifice of radiant efficiency," as compared with a fire without a flue, or with one only a few inches in length, although the canopy of the latter might be somewhat lower than in the other case.

This brings us to a point upon which it would be highly interesting to have Professor Bone's opinion. It is whether the slight dropping of the canopy of a gas-fire increases the "ventilating effect" more than a length of flue-pipe attached to the vent at the back of the fire, and whether for every unit length of flue-pipe added there is an increase in the rate of flow. Observe again in the opinion (in which no information is furnished as to the actual test conditions) there is no definite indication as to whether, when there is an increase in "ventilating effect," by whatever means obtained, the sacrifice in the radiant efficiency is great or small—the very indefinite statement only being made as to "a certain "sacrifice," which "sacrifice was the more marked," &c. We cannot tell from this whether the "certain sacrifice" would not be worth incurring under readily conceived conditions. With respect, we further submit that the same inconclusiveness appears in the final paragraph of the opinion. Professor Bone says his investigation has also disclosed the fact that, while "the new construction advocated does effect "the complete discharge of the products of combustion "through the flue vent, without any flue attachment" [for which expression of opinion one firm at least will be thankful], "it does not *necessarily*, on that account, give a better "ventilating effect than the other type of fire examined, "when both are working under the same conditions of flue "draught—in fact, quite the opposite is the case." The words "not necessarily" somewhat qualify the important part of the statement; and, in our view, further explanation would give to the sentence added weight.

Really we cannot extract much from the opinion before us that is of assistance in regard to the original statement (*literatim*) of Messrs. John Wright and Co. that set the ball of controversy rolling. Nor does Mr. Yates supply any statement or figures that constitute "his proofs" as to the correctness of the contention as it was originally framed. But perhaps now that Mr. Yates has put in an appearance (which we welcome) on this particular subject—the first since he himself raised it—the controversy that is bound to ensue may elicit definite figures, conditions, and other evidence which, in the interests of "a great industry "and the public," and the accuracy of scientific belief, would be of extreme value, and would assuredly lead to other competent research. Let it be clearly understood that there is no question as to the *bona fides* of Professor Bone in this matter; the sole question is, Is his opinion based upon, and does it confirm, the words used by Messrs. Wright and Co., in the first place, and which will be found towards the end of the first quotation in this article?

Reconsideration of the Draft Street-Lighting Specification.

It is safe to say the Illuminating Engineering Society have never done a better piece of work than when the Council gave an opportunity for an open discussion, through the paper prepared by Mr. A. P. Trotter, on the street-lighting specification that has been tentatively put forward as a standard by a majority of the members of the Joint Committee appointed by four representative bodies to deal with the subject. There can be no question to-day that a new road in the matter of street-lighting contracts has been opened up. The old order of contract will be gradually left behind, and a crude basis of bargaining will give place to contracts under which the lighting authority, on behalf of the public, will purchase what they want in the way of illumination, and the suppliers of the means of obtaining illumination will enter into a bond to supply what is required, and any infraction will mean for them a forfeiture. This being the position, there is no need to apologize for having published a fortnight since the principal portions of Mr. Trotter's paper, the draft specification, and a report of the opening discussion, and to-day a report of the major part of the concluding discussion which took place—not so much upon the paper as on the specification—at the meeting of the Illuminating Engineering Society last Tuesday. As a result of the discussion, it may be said with confidence that the specification, if it is not amended, had better at once be consigned to the waste-paper basket, as any attempt to set it up as a model for general acceptance would only end in disaster so far as it is concerned. We say this deliberately. In its vital part, the document has been roundly condemned; and to-day (while every man who has concerned himself in the matter acknowledges the interesting work of the Committee, and the earnest endeavour that certain of them have put forward) the majority of the Committee must feel that a mistake has been made, and that it would perhaps have been wise to have tried to amalgamate the views of the minority in the draft specification, rather than adopt what appears to outsiders to have been an unyielding attitude on the cardinal point as to the root of the specification being composed solely of minimum illumination. Something has to be done now that it would have been better to have done before, so that, in the event of a public discussion on the specification prior to final presentment, it could have come before any meeting with the impress on it of unanimity on the part of the Committee.

However, the open discussion has not been time and effort wasted. It has been valuable in helping to concentrate attention on the subject; it has done something to clear the air; and it has done something to distribute information among those who should know of these matters, as to what is incorrect, if not what is positively correct, in the matter of a standard street-lighting specification. We should not have had all this valuable material from the masterly speeches of Mr. F. W. Goodenough, Mr. Jacques Abady, Mr. Robert Watson, and several others, besides the views of a number of high authorities on the Continent and in America, if there had not been dissension, and honest dissension, over what we have described as the vital point of the specification. And now that there has been all this open discussion over this vital point, and such an overwhelming mass of technical authority against the majority of the Committee in regard to it, it would be sheer folly to recommend the specification, with the present imputation upon it of inherent defect and feebleness for the purpose in view, for adoption by the lighting authorities and suppliers of lighting agents throughout the country. It would simply sink into oblivion through disuse; and the work of the Committee—valuable work, too, except in the principal and most critical part of the issue of that work—would be entirely lost. It is not a long step to something upon which there really can be unanimity.

We will not here comment upon any of the speeches made, nor compliment individually any of those who made studied contribution to the discussion. They, and the learned corresponding members of the Illuminating Engineering Society, have done excellent work; and there is certainty that they have carried conviction, and have inflicted considerable damage upon the case for minimum illumination having exclusive existence as the standard in main street-lighting contracts. A standard so fine as minimum illumination running down to 0·01 foot-candle, exposed as it is to all sorts of error, to personal idiosyncrasies and disparity of vision, and other considerations which need not be particularly specified, as well as possibly provocative of endless dispute, is not the sort of thing to form the basis of a commercial contract, with heavy payments for the service, and penalties attaching for any digression in the downward direction from the sensitive standard condition. As it is hoped that an amendment will be made in the specification, and that something will now be produced that will be generally acceptable, we are writing temperately, and with every desire not to say anything that might act as an irritant at this stage. But we cannot help feeling that, when adopting minimum illumination alone as the standard, the majority of the members of the Committee showed a stronger leaning to the infinitesimal of scientific accuracy under impossible conditions than to practical commercial necessities. In this respect, the students of the subject abroad have shown themselves, in the majority of cases, to be their superiors in detecting the inconsistencies of the conditions within and outside the specification.

Minimum illumination was the central feature in the

second part of the discussion; and measurement on the horizontal plane and at 1 metre from the surface of the road also formed ground for a luxuriant amount of comment. While there was much destructive criticism, there was also constructive suggestion. Several speakers made suggestions for revision. We may mention Mr. Watson, Mr. Goodenough, Professor Morris, Mr. Abady, Mr. Rogers Smith, and Mr. W. R. Cooper; and there is every appearance, as the result, of a fresh attempt being made to rectify the strong cleavage in opinion, and to meet the fundamentally sound objections. Mr. Trotter himself, while not expressly conceding that there is fault in any one particular of the specification, considered that a case had been made out for reconsideration of the objections. The last has not therefore been heard of the matter; we should be sorry if it had been. But amendment there must be; for anything set up as a "standard" in a matter of this kind forfeits the right to the title if there is not an adoption so large that it may be called universal. Without amendment, it will fail; the work of the Committee will have been in vain. This would be a pity. Meantime, it will be observed that we have not, in this brief article, pointed the criticisms that were made last Tuesday. Some of them were trenchant, and certain it is that members of the majority of the Committee now see the strength of the case of those who are opposed to a standard resting on minimum illumination alone; and a surprising thing is that electrical station engineers have not also raised their voices in protest. Perhaps the reason is that the amount of photometrical experience they have had has been insufficient to cause them to see the inadequacy of the standard and its critical nature for contract purposes, as distinct from technical work for information only. We believe that the event will prove that they will have something for which to thank their gas friends, in saving them from an untenable position in connection with the proposed specification.

Vertical Retort Installations for Small Works.

THE idea once got abroad, and we know that it still persists to a fairly considerable extent, that the vertical retort system is not for small works. But gradually experience here and there is dislodging the mistaken notion. A notable case is Lurgan; and the gas industry is indebted to the progressive spirit of the Directors of the Gas Company of that town, and to Mr. Wilfred Tallentire for an article which he contributes to our columns this week, detailing the actual results from a continuous twelve months' working of the installation of Glover-West verticals that he has in use. Lurgan now depends entirely for its coal gas on the vertical retorts; the old horizontals having been completely demolished. This fact alone carries testimony. The installation consists of a setting of eight retorts, in two units of four; and any retort or any number of retorts can be discontinued at will. The system accommodates itself with perfect ease to the variable conditions of Lurgan. Better evidence there could not be on this point. But the central feature of Mr. Tallentire's communication is found in the results of a complete twelve months' working in comparison with the old horizontal system, which, it is only fair to say, had arrived at a stage at which, for reasons of economy and safety, dissolution had become imperative.

Bearing all this in mind, it is seen that, under the new system of working, less coal had to be carbonized in the twelve months to produce more gas than in the final complete year of the horizontal working—this, of course, being due to the larger quantity of gas produced per ton of coal. There was also more coke for sale, owing to the lower fuel account; and carbonizing wages were reduced. Whatever the price of coal, the lower quantity that had to be purchased—358 tons less—meant a saving; and yet the smaller quantity of coal yielded nearly 2,600,000 cubic feet more gas for sale. Through the saving of fuel, though less coal was used, there were, we calculate, 241 tons more of coke for sale on the quantity of coal carbonized; and the coke is no doubt of a better quality, with less moisture in it, than was the case with the coke under the former system of working. Then on the 3958 tons of coal used, there was a saving in carbonizing wages of 9·78d. per ton. In addition to this, there has been complete freedom from naphthalene troubles; and this has monetary value. Of course, it cannot be expected that results can with such a small installation come up to those produced with an extensive installation; but it is evident that the Lurgan Gas Company have made a good investment. For such moderate carbonizing requirement, power machinery and horizontal retorts would have been impossible; and there would not have been the same elasticity about such an installation as is the case with the present one. The savings and profits represent a very high percentage upon any additional capital expenditure that may have been involved. In future when there is any talk of modern carbonizing systems being unsuitable for small works, we shall turn to Lurgan among other places for the disproof. In recognizing the enterprise of the Directors of the Company and their Engineer, we heartily thank Mr. Tallentire for the excellent testimony of his short article.

Discrepant Test Results of Refractory Materials.

A LETTER from Mr. John West in our "Correspondence" columns this week treats of a subject that demands the serious attention of the gas profession generally, and of the Refractory Materials Committee in particular, together with the manufacturers of refractory fire-goods. If the work of the Refractory Materials Committee is to have full effect, the conditions laid down as to testing for refractoriness must have common application, as otherwise the gas industry will not be any better off in the matter of assurance than before the Committee commenced their work. If some method of testing different from that agreed upon by the Committee is applied in certain cases, it is obvious that there may be considerable variation in the results so obtained and those that are realized under standard conditions, though the same material be used. And it is equally obvious that a great amount of unfairness may ensue, through a fictitious value being placed on material, as between manufacturer and manufacturer, and as between manufacturer and customer. Gas engineers do not want, and steps must be taken to see that they do not get, refractory material showing a degree of refractoriness that, by the method of testing adopted, is inflated beyond that which would be obtained under the Committee's standard conditions. Yet Mr. West has evidence that this is actually the case; and he supplies an illustration of an instance in which part of a brick was sent to one analyst and part to another (Dr. Mellor, who worked to the Refractory Materials Committee's standard conditions), and the result of the test of the former analyst, working on methods of his own (which it seems include certain private correction factors), was some 600° Fahr. superior to the result obtained by the latter, complying with the standard methods.

This, to say the least, is very misleading to gas engineers buying materials, unless it is specifically stated that the tests showing the high result are not the product of working to the recognized conditions; and, in competition, it is likewise extremely unfair to manufacturers whose materials are tested under the latter. Take two manufacturers in the same district using practically the same material, tested by two different analysts—the one giving his authority for stating, through his private supplementary calculations and corrections, that the heat-resisting power of the material is 3632° Fahr., and the other, under the conditions laid down by the Committee, showing that it is 3038° Fahr. The larger figure naturally looks the more tempting, and may result in the order being placed with the firm showing the higher result, though intrinsically the material is no better than the other. If half a brick entirely made from the same material can show, by the one method, a difference of 600° Fahr. above the result secured with the other half of the brick under the standard method, the difference is sufficient to prove that it would be quite possible for a material of an intrinsic value lower than another to be certified by an analyst, whose methods of testing or correction of results are not known, as having a higher heat resistance than the material of greater intrinsic value. Such a position is most unsatisfactory.

What should be done in the matter? There are the interests of the users of refractory materials and of the manufacturers to be safeguarded against the results of testings which, in any particular, do not conform with the standard lines advocated by the Refractory Materials Committee, and so produce discrepant results. It is a matter that the Committee should take up and investigate, and then make known the result. The evidence that Mr. West has in his possession is available. Of course, the Committee have no power to compel manufacturers or analysts to work on common lines—they are free to use their own discretion. The power of compulsion lies on the side of the buyers.

They can at present have no assurance that one material actually possesses a higher refractoriness than another as represented by figures, unless they are satisfied that the two materials have had their results produced and rendered on the same basis. Therefore, they should refuse to buy material that has not the guarantee attached that it has been tested under the conditions prescribed by the Committee. It is the only way that all manufacturers and all analysts can be brought into line. Mr. West suggests that the Committee should publish a list of analysts who are prepared to work only to the Committee's conditions, and that buyers should insist on a certificate from one of the registered analysts. A list of manufacturers prepared to guarantee that their tests for refractoriness conform strictly with the Committee's proposals would also be useful. In advertisements for fire-clay goods, a line might also be specially inserted requiring a test of the material according to the Committee's conditions. These are among the ways of correcting the existing anomalous state of things, and of producing uniformity. We trust that the matter will not be left here; but that something more will be done towards co-ordinating testings, so that a customer for refractory materials may know the relative qualities with somewhat more confidence than he can possibly do to-day, under the circumstances now detailed by Mr. West, who deserves to be thanked for drawing attention to the matter, and giving the results of his own experience.

The Economy of Concentration and Reconstruction.

THE members of the North of England Gas Managers' Association had two thought-inspiring papers presented to them on Saturday last—the one by Mr. A. B. Walker, the Engineer of the Walker and Wallsend Union Gas Company, on the "Results of Concentration of Works;" the other by Mr. R. Nelson, the Engineer of the East Hull Gas-Works, which gave particulars of the results of the operation of the Dessau plant there, which particulars are supplementary to those supplied in the paper that he read twelve months since. Regarding Mr. Walker's contribution, it showed the valuable material effects that have resulted from the judicious decision, on a multiplicity of grounds, to concentrate his Company's works on a site the position and area of which alone presented economic certainties. After reading the paper, we are inclined to think that the House of Lords did a really good turn for the Company and their future when, before the site of the present new works was obtained, it declined to allow them to purchase compulsorily the freehold of a site adjoining their then existing works, which site the proprietor had declined to lease for more than thirty years. The removal and concentration of the works have resulted in many economies and enhanced efficiencies, due to the modern plant, transport facilities, relief from congestion, and freedom of operations, besides which the strength of the undertaking has been raised in the matter of assuring an uninterrupted supply of gas of even quality, and of generally protecting the consumers from any dire results of external origin. Apart from the tangible value of what has been achieved, there is an unassessable value in the Company's present position compared with the old.

The list of politic considerations given by Mr. Walker in his paper, which animated him in advising his Directors as he did in the year 1905 to face what had become imperative if the best was to be made of the Company's privileges and opportunities, appeals to us as possessing an unassailable robustness; but it is not given to all engineers to be in the position to present such a complete and unanswerable case to a scheme of such magnitude. The ability of an engineer is shown not only by his constructive powers, but by the wisdom he displays in fixing on the right time for scrapping, modernizing, transforming, and even removing his works. There can be no question about it, though Mr. Walker does not say so, that his manufacturing figures and the financial gains, which, capitalized, represent a considerable financial advantage, are a complete justification of our submission that he resolved upon his recommendations and scheme at a time of great appropriateness; and the working figures also declare on their very face the high efficiency of the new plant—not over any short period, but over some five years' working. We will not review the figures which testify to these facts; they show economy and profit throughout, as will be observed by reference.

An interesting experience is recounted in the paper concerning carbon disulphide and lime purification; but there is wanting a little more explanation to show the cause of the effects as related. Briefly the point is this: Prudence suggested, when the Company obtained relief from the sulphur clauses, that two lime catch-boxes should be installed. The results were gratifying, and the lime received the credit, until investigations proved that there was no more carbon disulphide at the inlet of the lime purifier than at the outlet. The finding was confirmed. The only explanation given is that an analysis showed that the lime in the catch-box contained 95 per cent. of calcium carbonate; but this only gives us the end of the story before the part that leads up to it. However, the box was emptied; and oxide of iron was the replacing material. An average of carbon disulphide rarely exceeding 20 grains per 100 cubic feet shows that Mr. Walker need not now trouble over lime purification. But it would add to the interest of this carbon disulphide experience if something descriptive were said as to the coal used at Walker, weights of charges, dimensions of retorts, and carbonizing temperatures, because Mr. Walker is doing well in realizing such uniformly low averages without lime. He is doing somewhat better, in fact, than Mr. Nelson with the Dessaus at East Hull; for the average sulphur on a twenty-seven weeks' continuous run of the verticals is 26·6 grains per 100 cubic feet, and lowness of sulphur compounds (of course, the figure is not an unreasonable one) is one of the claims made for the Dessau system. All along the line of manufacturing results, Mr. Nelson exhibits improvements from the Dessau work, compared with those (which were also good) included in his paper twelve months since. It shows that the plant has been "tuned-up" to a higher pitch. The analysis of the gas exhibits a little rise, but a negligible one, in the carbon dioxide and nitrogen. Nevertheless, the calorific power has improved.

New Coinage and Slot Meters.

From different quarters, we have heard of trouble with slot gas-meters through increased rim thickness of pennies of the later coinage; and the matter is a really serious one, and would be more so if there were any intention on the part of the Mint authorities to henceforth continue to desert from the peripheral standard. But the gas industry generally will be pleased to learn, from letters that have passed between Mr. Herbert Lees, in his capacity of Hon. Secretary of the Special Purposes Committee of the North of England Association, and the Master of the Mint that any departure from the former standard thickness has not been intentional, nor is it proposed there shall be any permanent change. The courteous letter received by Mr. Lees from the Royal Mint will allay any fear that may have arisen over this question. The Master of the Mint recognizes the trouble and inconvenience to gas undertakings and to the poorer section of their customers that must result from the circulation of pennies of a thickness greater than that for which the mechanism of prepayment meters was made; and he is desirous of being helpful in the matter. He admits that, from representations that have been made, in "a few exceptional cases" the standard thickness has been exceeded. This seems to indicate that there is only a limited number of these pence of extra thickness in circulation; and, with respect, we suggest that the withdrawal of such pence, through the agency of gas companies and banks, would be a simpler proceeding than any "slight modification" of slot mechanism to reduce the possibility of failure. Alteration would not be a difficult matter in connection with the mechanism of new meters; but there must be now close upon 3¾ million slot gas-meters in use in the United Kingdom (a large proportion of which are for pennies), and to alter them would be seriously costly and inconvenient. Some of the meter manufacturers have already had personal interviews with the Mint officials; and the Master expresses his willingness to afford assistance to any other manufacturers who will send to the Mint a technically qualified representative. The letters referred to here are published in our "Correspondence" columns.

Labour Matters in South Wales

The statement made some weeks ago that there were over 50,000 non-unionists at work in the South Wales collieries, and that an earnest endeavour was to be made to bring them within the fold, gave promise of another exciting time in this much-troubled industrial centre. The effort has now been made, and fortunately the disturbance of the output of coal has been less than might have been feared. By agreement between the owners and the men's representatives, the great scheme of the Federation

was brought into operation on May day, when the whole coalfield remained idle—the intention being that work should be resumed the following day only at pits where no non-unionists remained. Many men had already hastened to join the Federation, on seeing the shadow which coming events had cast before them; and many more followed suit, in consequence of the demonstrations made on the "Welsh Miners' Labour Day." For the remainder of the week there were many men idle at different pits; but the position was at no time a really serious one, and gave promise of being rapidly smoothed out. In one case, the presence of a single man who refused to produce a Federation card was sufficient to cause 2000 unionists to cease work; and in another part of the field 5000 men struck because twenty non-unionists were employed at two of the pits. These examples serve to indicate the thoroughness with which this coercive programme has been planned and carried out. At the same time, it is probable that a considerable proportion of the success that has attended it is due to the assistance rendered by the colliery owners to the Federation officials in the carrying out of a peaceful campaign. The South Wales Miners' Federation have hit upon a plan for strengthening their ranks and their financial resources which they will surely repeat when flagging enthusiasm on the part of the men again makes itself manifest.

And in New South Wales.

The recent gas strike in Sydney, a full account of which appeared in the last issue of the "JOURNAL," was the subject of an instructive article from the Sydney correspondent of "The Times," which was published by our contemporary on Saturday. The history of the matters which led up to the strike is briefly recounted; and this is followed by the remark that the cause of the strike suggests what is, perhaps, the greatest stumbling-block in modern industrial disputes. The men's reply to the argument that the companies could not pay increased wages and maintain their present profits unless the new rates of pay were made an award of a board (thus enabling a higher price to be charged for gas), was that the profits were excessive, and should be reduced. The answer to this was, of course, that though the profits might appear large on the amount of capital originally invested, present holders, most of whom bought their shares at a high price, in reality secure a very moderate return. During the discussions on the Gas Bill, it was said by the companies that if they reduced the nominal return from 15 to even 10 per cent., this would really mean the reduction of the actual dividend received by most shareholders from 5 to perhaps 3 per cent. That is to say, remarks "The Times" correspondent, where a single employer might consent, or might be easily constrained, to reduce his profits instead of passing on to the consumer the increased expenses, a joint-stock company whose shares are on the market does so with greater trouble. The difficulty, he adds, though not a new one, "is impressing itself for the first time on the minds of many Australians; and when the machinery of modern commerce comes into collision with the demands of modern employees—especially in such a democracy as the Australian—it is not easy to say which will suffer most."

Benzol as Fuel.

In the course of an article on "The Future of British Fuel" which appeared in the Engineering Supplement to "The Times" last Wednesday, the writer referred as follows to the possible utilization of benzol as fuel: "It has been satisfactorily proved that benzol is an efficient and satisfactory fuel for internal combustion engines; and the problem is to obtain a sufficient supply at a reasonable cost. Benzol is principally obtained as a bye-product in the manufacture of lighting gas and coke; but the amount which can be got under present conditions is limited by the peculiar necessities of these industries. As stated by Professor Vivian B. Lewes, coke may be divided into two main classes—(1) metallurgical coke and furnace coke made by processes in which everything has been done to obtain the largest yield of coke having definite characteristics, and in which the bye-products (gas and tar) are either disregarded or considered of secondary importance; and (2) gas coke made by processes designed to give the largest yield of gas, in which as much of the carbon as possible must be in gaseous combination—the coke residue and tar being looked upon as of secondary importance. As regards the first of these classes, supposing that all the coke is manufactured in bye-product ovens, and that means are adopted for extracting all the benzol, the maximum amount obtainable will depend upon the demands of the metallurgical industry; and it is improbable that any increase in quantity will be sufficiently rapid or considerable."

ELECTRICITY SUPPLY MEMORANDA.

THE high-pressure gas-lamp has always been an object of great antipathy on the part of the men of the electrical industry, and more so since a doubling of its lighting efficiency per cubic foot of gas consumed, and the considerable improvement in the lower hemispherical distribution of light by the change from vertical to inverted burners, gave it such a big advantage over high-power electric lamps. In showing resentment over the displacement of flame-arc lamps by high-pressure lamps, there have been several electrical acts that have bordered on the ridiculous; some have passed over the border. One of the latter has been the action of several undertakings in charging high prices—in certain cases, close upon maximum prices—per unit for energy where electric-motors are used for driving the gas-compressors for private installations. There is considerable doubt as to whether they all have the power to do this; and we have not yet come across an electricity supply undertaking the management of which has cared to carry the matter to litigation in the event of a user of energy for motor purposes (which motor is employed for driving a gas-compressor, and not a knife-cleaning machine or a hairdresser's brushing-machine) refusing to pay on a scale higher than any other small motor user, who gets energy at a cheaper rate per unit without any stipulation as to the purpose to which the motor is to be applied. The gas industry does not desire to be at all unreasonable in the matter, because the chances are that, before very many more years have passed, except perhaps in the smaller towns, there will not be any great necessity for having isolated gas-compressors, as progressive gas concerns are gradually getting in their high-pressure distribution systems worked with central gas-engine-driven compressing-plants. Many gas engineers, we know, would much prefer to pay double the highest charge for ordinary power purposes for gas-compressor motors rather than have any bickering over the matter with their electrical competitors. The Derby Gas Company, as mentioned in our "Parliamentary Intelligence" last week, have shown greater generosity than that; for they have, in settling their opposition to the Corporation Bill in Parliament, while dropping a proposed electrolysis clause, agreed to one which prohibits the Corporation charging for energy for the use of gas-compressors at a higher rate than the top one charged by them for the time being for electricity for lighting purposes. There may have been diplomacy on the side of the Company in not pressing the right to recognition on power terms, but as high-pressure gas-lamps are usually employed for shop-lighting, and as electricity for outside shop lighting is often supplied at lower rates than for domestic lighting, we should have preferred to see the qualifying word "shop" inserted between the words "for" and "lighting." However, the action of the Derby Gas Company may serve as a suggestion for other gas undertakings. Another clause obtained by the Company pledges the Corporation to make reasonably sufficient provision for the ventilation of their underground electric distribution plant, in order to prevent the accumulation of gas. The clause does not say whether coal gas or bitumen gas; but the one ventilation may serve for either. It is as well to say "may," because the generation of the later gas, when it starts, is rapid; and we rather fancy that, though Nottingham, Hebburn-on-Tyde [see the "JOURNAL" columns last week], and London have demonstrated that its explosive property is high, its specific gravity is greater than that of coal gas. So that, in addition to ventilation, it might be well for electrical undertakings to provide exhaust fans for extracting the bitumen gas from their culverts and street boxes.

Power for Gas-Compressors.

Suppressio Veri, Suggestio Falsi.

More than once we have had occasion to accuse "Meteor" and the "Electrical Times" of having (even after their attention has been called to the matter) suppressed important facts in dealing with affairs in which gas is concerned. That is a journalistic manner that is perfectly unfair, and is not, we are pleased to say, universally practised. Instances have been cited in our columns, and statement has been made as to the respect in which there has been suppression. There would not be the slightest care about this if it were not that some of the misleading information extracted from the columns of our contemporary is used up and down the country, for the purpose of obtaining an advantage over gas. So far as we are able to correct any misrepresentation of the kind among the electrical engineers who read the "Memoranda," we shall continue to do so. Take the Slough Workhouse lighting, for example [*ante*, p. 159]. "Meteor" still declines to place his readers in possession of the full truth, though, we know, the whole facts have been in his possession for some weeks. The last issue of our contemporary at the time of writing this paragraph makes reference to our attacks on the suppression of facts relating to this matter; and this is the first occasion that there has been, so far as we have observed, any allusion to the fact that the electric lighting bill at the Slough Workhouse compares with a gas-lighting system that was practically wholly of the flat-flame type. Even now there is nothing said regarding the point that the figures published as a comparison should be further discounted by the fact that the account for gas included a large gas hot-plate, a gas-oven, half-a-dozen boiling-rings, and

conservatory heating. Electrical people must be in a bad way for argument if they find it necessary in their commercial campaign to descend to a persistent concealment of points that give a totally different complexion to a tale. A daylight housebreaker, some one who writes for the "Electrical Times" will agree, is honest in comparison. At Lewisham, "Meteor" says that electricity was found to be cheaper than gas even with mantles. The whole tale of the Lewisham business has not yet been told. Light for light, hour for hour, electricity with metallic filament lamps, at the Lewisham Workhouse or anywhere else, is not cheaper than gas, at ordinary prices, used in the inverted gas-burner of to-day. Perhaps "Meteor" will tell his readers why the Electricity Company found it necessary to come down to nearly half the prices for energy for power and lighting that they originally quoted to the Lewisham Guardians. It is an interesting story—especially for electricians.

A Vitally Important Thing!

Knowing well the truth of our allegations respecting the suppression of facts called for by fair play, "Meteor" turns off into a side path of absurdity, and supplies some rather amusing reading. He says at Lewisham "the gas mantle light could not be turned down—a vitally important thing in an infirmary." "Gas-mantle lights" are frequently turned down by their users. In numerous churches, Sunday after Sunday, "gas-mantle lights" are lowered. But with electric light, there can be no turning down—it must be full light or total extinction—unless use is made of one of those fantastic and wasteful contrivances that have been produced, such as the dimmer, and which have not become popular. Often with the electric light in infirmaries and workhouses, as elsewhere, there has been total extinction, and an equally total incapacity on the part of those who want light to obtain it. We have instances, too, of the total failure of the light in hospitals during surgical operations, which is not a pleasant thing to contemplate, and also during confirmation services in churches, which has rather detracted from the solemnity of the occasion. And yet "Meteor" comes along and makes a song, for want of something more effective, over a supposed unsuitability of the "gas-mantle light" for "turning down" in workhouses and infirmaries! Wonderful "Meteor"! But it seems that at Slough "this fatal defect" did not exist; for the flat-flame gas-lights could be turned up or down. Therefore it appears "the method of lighting at Slough"—that is to say, flat-flame lighting—"represented the very best that gas could offer to comply with the conditions." Really, we do not know what all this small talk in our contemporary really means. Why the necessity for turning the gas up or down? Is it to realize economy? It cannot be anything else, seeing that the installed electric lamps cannot be "turned down," but must be either doing full duty according to the best of their power, or be totally extinguished. Then let us see to what "Meteor's" absurdity brings him. With a flat-flame burner, an illuminating power of only 12 candles per 5 cubic feet of gas consumed per hour can be obtained. If, for economy, the lights be turned down to a point at which 1 cubic foot per hour is consumed, we get to a consumption of gas which, if used in a bijou inverted burner, would give a light of 20-candle power, or 8 candles more than the flat-flame burners would give when consuming 5 cubic feet per hour—nearly twice as much light, and a saving of four-fifths of the gas! Where then comes in the necessity for "turning down" these lights, which is said by "Meteor" to be a "vitally important thing in an Infirmary." We live, and learn of the existence of wonderfully queer notions in the electrical world—notions that are created and brought into prominence simply to serve electricity supply. We shall be pleased to learn whether it is true that any responsible representative of the Slough Gas Company, as "Meteor" states, reported that it "was impossible to have lighting with incandescent mantles in the passages and other parts of the [Slough] workhouse, as they would not stand the draughts and vibration." If the draughts and vibration are such that mantles cannot stand, then the workhouse ought to be condemned as unfit to shelter aged and otherwise homeless folk. Along the fronts of many of our sea coast towns stand gas mantles doing good service. Many factories in which there is moving machinery and many railway stations are lighted by gas mantles—Victoria Station among them. What is to be the next piece of absurdity, "Meteor"?

The Day of Reckoning.

It gets a bit wearisome to have to be constantly dealing with the corrupt cost comparisons that some electrical competitors make between installations of flat-flame gas lighting and installations of electric metallic filament lamps. They, of course, know as well as we do that this is not a creditable thing on their part; and yet they do it, because, if they did not, they could never show a saving on gas lighting, all things being equal in regard to candle power and time. But an annoying thing is the frequency with which they have the opportunity of making these comparisons. We are constantly coming across comparisons in which the electricians show savings on the lighting bill in connection with churches, workhouses, infirmaries, and other public places; and, when the matter is investigated, it is found that, in these places which are more or less under the public eye, 1913 finds them still fitted with the antiquated system of flat-flames. What are we to say under the circumstances? The unfairness of the comparison is easily shown; but the very existence of the flat-flame burners is sometimes a reproach to the gas suppliers of the district. It is all very well to talk of pig-headed guardians, vicars, and others who will not go to the expense of modernizing the burners; but at times we cannot help thinking that the fat flat-flame lighting account is one of the reasons for a little more active enterprise not being shown in attempting to induce conversion. The day of reckoning comes, as it comes to most people who mismanage things. Far better would it be to expend money in demonstrating what can be done in these public places than to allow the ill-consequences of remissness to some day fall upon the gas undertaking, through the publication of savings—however defective the foundation for those savings may be—that the electricians are sure to make for the purpose of impressing even a false economy on people who are unacquainted with the facts. See how simple a matter it is to show considerable saving. With a gas from which in the 16-candle standard days we could photometrically get 2·4 candles per cubic foot using a flat-flame burner, or 12 candles per 5 cubic feet, one is only able to show 2400 candle-hours per 1000 cubic feet. It only requires 3 units of electricity with metallic filament lamps to produce these 2400 candle-hours. In many places, it must not be forgotten, the standard candle power of the flat-flame period has been reduced, so that comparison may be even worse than this. The parable of the foolish virgins was told many hundred years ago. In the early years of incandescent gas lighting, the tale was told of how Sir George Livesey got the local authorities of South London to have their street lamps converted from flat-flame to incandescent burners, and to pay for the change out of the savings effected on their gas bills. The local authorities and the public obtained the benefit of improved lighting; the Company lost some portion of their former receipts for gas; in new district developments the number of gas-lamps increased; and to-day where is there a populous area that has less electric street lighting than South London? The present and the future are always bound up together. In business matters, that is a much-neglected fact.

Popular Fare.

The "Standard" has given its readers its second instalment of good old-fashioned electrical fare for popular consumption. It has got Mr. H. H. Holmes, the Sales Manager of the Marylebone Electricity Department, to talk (among other things) of the "fumes" from gas-stoves, and of the alleged Maskelyne and Devant performances of the electric-oven in giving forth more meat than any other form of oven taking equal weights of meat. But we do not see that Mr. Holmes traduces his own intelligence by adding that this is so with equal temperatures and equal cooking periods. However, leaving Mr. Holmes and the aged stock tales, there are a few interesting points in the general material comprising this second instalment. An allusion is made to the show-rooms of the Westminster Electric Supply Corporation. Among the objects of interest is a new "directive" fire—a thing much needed on a cold day where electric heating is in use. Parabolic metal mirrors are employed; so that the heat can be directed on to one spot, in order not to let any of it go astray. That is to say, if one's feet are cold, the heat can be concentrated on to them; or if any other part of the human structure wants warming up, all that one has to do is to concentrate the heat on to that part. We know that part heating of the kind is recommended as an excellent way to give a person a cold. But that can be overcome by using batteries of the directive fires on all sides of the room, so that there may be a fair balance of heat falling on all external parts of the human structure. Then there is another exhibit—a combined electric rug and bed warmer. One can walk about, or stand on, this electric rug on a cold day, and feel the warmth from it about the lower members; and then at bed time the individual can take it with him or her, and use it as a heat-giving coverlet for the bed. One electric rug will be of little use for a large family; it will be necessary in such a case to have several. The warning ought to be given that if one is going to use the rug as a bed warmer, great care should be taken not to walk or stand upon it with boots on that have been in use in the streets. Visitors to the house who desire to use the hearth-rugs that are afterwards applied as bed covers ought to come provided with their own slippers.

The Pollution of the Hertfordshire Colne.

The action brought by the Friendly Anglers' Society against the Watford Gas Company, to recover damages for the destruction of fish in the Society's fishery in the Colne below Watford in May last, has been settled by the payment by the Company of £550 and full costs. This case of pollution it will be remembered caused considerable stir at the time it occurred. It was at first suggested that road-tarring might have been the cause of the trouble; but after exhaustive investigation the Thames Conservancy prosecuted the Gas Company at the Watford Petty Sessions for having contravened sections 91 and 92 of the Conservancy Act by discharging into the river gasholder tank water containing cyanogen compounds. The Company pleaded guilty, and were fined £20 and £30 costs. The proceedings referred to were reported in the "JOURNAL," Vol. CXIX., p. 336.

At the Royal Institution next Saturday, Mr. H. A. Humphrey will deliver the first of two lectures descriptive of his internal combustion pump.

NOTES FROM WESTMINSTER.

PROGRESS with Gas Bills is being made at an almost unprecedented rate. The fact of the matter is the modern form of powers which gas undertakings now seek have received such an amount of ratification from Parliament that there is little use in offering opposition if the promoting company or local authority are reasonable in the conditions embodied in their Bill. It is fully recognized that the present course of events in statutory authorization is proper and sound in the interests not only of gas undertakings, but of the community generally. Providing the terms are satisfactory, no one can, for instance, object to-day to the extension of the limits of a well-established gas undertaking, and to the advantage that outlying districts receive by the small undertakings supplying them being absorbed by neighbouring larger undertakings. Things are now altogether different from what they were. Concentration of manufacture within limits is economically beneficial; and the transfer of gas to outlying areas can be conducted by the application of high pressures. Parliament is also sympathetically inclined to those gas undertakings that are in a position to supply territory that is within the parliamentary confines of other undertakings, but has been left fallow by them. Further, those who stand as guardians to the public interests are now better educated than they used to be on the subject of the illuminating power of gas. Parliamentary proceedings have helped in this matter; and the steps taken by gas undertakings in their own localities, and by the publicity organization of the gas industry, to develop the application of gas to all domestic purposes for which solid fuel has been used, as well as to many purposes in industry, have assisted in making known the absurdity of maintaining, at the cost of the users of the thermal power of gas, the luminosity of the naked gas-flame. There is also a growing appreciation of the fact that, where electricity supply is needed, and an undertaking for the purpose does not already exist, the local gas undertaking can meet the demand more economically than can be done by the establishment of a new concern. Parliament also recognizes that the gas industry—extensive in its operations, employing much capital, and in numerous ways spreading much work throughout the country—has as much right to protection as other industries. It was not always so; it is so now. Thus for a period matters appear to have settled down on conditions that are largely accepted as normal, under the changed circumstances of the industry in the matter of its growing usefulness to the community. There is no use opposing on matters that form part of a natural development in these times, unless there are circumstances of some unusual character environing, or attached to, the proposals. These considerations partly account for the quiescence of the present session.

Gas and Electricity Supply.

The Tottenham Gas Company's Bill—for the transfer of the Enfield Gas Company, for empowering the Company to supply electricity in the Wood Green district, and for authorizing them to enter into negotiations for the transfer of the electricity powers of other local supplying authorities within their area—is gradually freeing itself from such opposition as it encountered. The opposition has been of a frail nature in comparison with the amount of local support that the fundamental parts of the Bill are receiving. The Tottenham Gas Company have been good servants to, and have fulfilled their parliamentary obligations scrupulously in, the districts supplied by them; and they have contributed largely to the development, and taken good part in the life and work, of the localities they serve. The North Metropolitan Electric Power Supply Company were not in a position to offer the residents of Wood Green such good terms in respect of electricity supply as the Gas Company; and, therefore, against the interests of Wood Green, they entered an opposition to the Gas Company's application for powers of electricity supply. They failed before the Board of Trade in substantiating their right to powers in preference to the Gas Company; and they have failed again before the Court of Referees in establishing *locus* against the Gas Company's Bill, and, moreover, without the Gas Company being heard. The Parliamentary Authorities have a perfect right to defend communities against the senseless waste of money in Committee-room conflicts, particularly when it is very clear that the promoters before them are in a position to satisfy the requirements of the community on the best terms. The Herne Bay and the Westgate and Birchington Gas and Electricity Bills are also unopposed in the Commons; and, in all other directions, the applications of gas companies for electricity powers are proceeding smoothly. There is a little delay with the Crowborough Bill, as (apart from what transpired in the Commons in the way of lowering the proposed standard price of gas), the Lord Chairman wants to satisfy himself that the interests of the gas consumers in the matter of price are adequately safeguarded, and will not be jeopardized by the electricity branch of the business.

Calorific Power.

The Redcar and Coatham Gas Bill is unopposed. The promoters were asking for a 12-candle power standard; and the Local Government Board called attention to this. Meantime the Company have agreed with the local authority to the introduction of calorific power clauses on the lines of the Wandsworth Act of last session. Why they did not adopt the South Suburban clauses as a model we do not know. They are very similar to the Wandsworth, but the terms are all British. We have been advocating the adoption of the latter, in order to get future clauses on a uniform basis in regard to—not necessarily figures, but conditions and nomenclature. Two local authorities (one of them the York Corporation, whose purchase proposals are dead) and one gas company in this session asked for a calorific power standard in substitution for the illuminating power one; and they all preferred the B.Th.U. clauses of the South Suburban Company, rather than the calorie clauses of the Wandsworth Company. We have to stick to the cubic foot. Let us also maintain allegiance to the B.Th.U.

Tunnels and Underground Property.

The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Metropolitan Water Board entered appearances against the City and South London Railway Bill, and asked for special protection for their distribution systems in connection with tunnelling works. There is a clause in the Bill giving general protection to property owners in respect of damage. Mr. Honoratus Lloyd, for the promoters of the Railway Bill, urged that the insertion of a special clause in favour of the above-mentioned petitioners would make it appear that gas and water mains were superior to other people's property. Mr. Lloyd knows full well that they are superior; and a little more consideration on the part of the Select Committee ought to have satisfied them on the point. As large populous districts are dependent on the distribution systems being maintained intact for the constancy of their gas and water supplies—upon which intactness domestic convenience, health, continuity of industrial operations, and safety all rely—there is surely a strong case for special protection.

Water Measures.

The Water Bills promoted this session are giving rise to a fair amount of contest. Water measures usually do. There are so many people who think they are prejudicially affected by the proposals of such measures; and therefore those responsible for the provision of water are on all sides obsessed by the rights and privileges, real or supposed, of other people. Therefore, there are few Water Bills that get through without bringing to the surface the displeasure of some one or more authorities or private owners. The arbitrament of a Select Committee is the only way out of the several difficulties raised. Among the Bills which have been fought on divers points before Committees have been the Bradford Corporation Bill, the one authorizing the transfer of the Bishop's Waltham Water-Works Company to the South Hants Water-Works Company, the West Hampshire Water Bill, the Pontypridd and Rhondda Water Board Bill, and the measure to sanction the transfer of the Rochford District Council water undertaking to the Southend Water Company. All these Bills have succeeded before Select Committees, after agreements and adjustments had been made. The nature of these agreements and adjustments—they are many, and cannot be all briefly explained—can be gathered by reference to the summarized reports published in our "Parliamentary Intelligence." The Ebbw Vale Water Bill is now being discussed.

Separating Ammonia, Cyanogen, &c., from Crude Gas.

Herr L. Bergfeld has taken out (for Germany) a patent for a process for the simultaneous separation of hydrogen sulphide, ammonia, and cyanogen from the crude gases resulting from the distillation of coal. The following particulars of the process are from an abstract of the specification in the current number of the "Journal of the Society of Chemical Industry." The purifying material consists of dehydrated copper sulphate or a mixture of salts—*e.g.*, alkaline-earth sulphates or chlorides, which combine with ammonia but not with hydrogen sulphide, with metallic oxides capable of combining with hydrogen sulphide. It is treated with ammonia gas before use. The reaction which takes place is of the type:

$$H_2S + NH_3 + CaSO_4,NH_3 = CaS + (NH_4)_2SO_4.$$

At the same time, some sulphurous acid (which is fixed by the purifying material) and sulphur are also formed according to the equation:

$$SO_3 + H_2S = H_2O + SO_2 + S.$$

When the purifying material is exhausted, it is heated, with regulated access of air, whereupon the following reaction occurs:

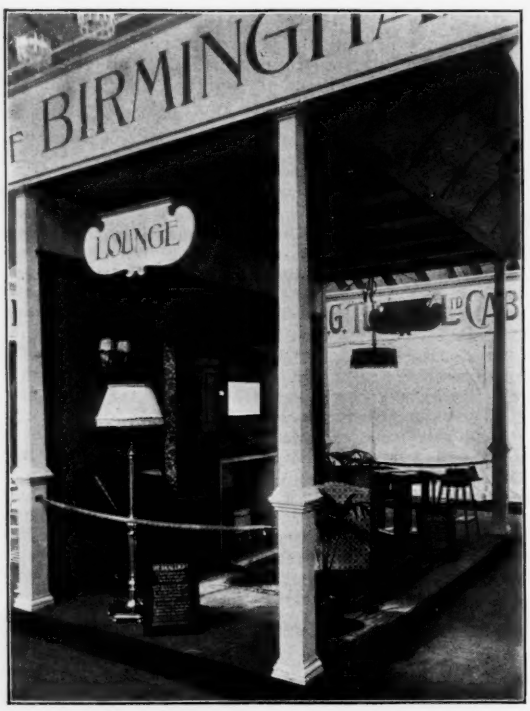
$$CaS + (NH_4)_2SO_4 + 3O = CaSO_4 + SO_2 + H_2O + 2NH_3.$$

Ammonium sulphite with 1 molecule of water of crystallization is deposited in the receiver, and in presence of air is rapidly oxidized to ammonium sulphate with gentle warming. Cyanogen in the crude gas is fixed by the purifying material as cuprous ammonium cyanide, which during revivification yields ammonia and carbon dioxide—any thiocyanate giving ammonia, carbon dioxide, and sulphur dioxide. After passing the purifying material, the coal gas may be further purified by leading it over alkali or alkaline earth sulphides, and, if necessary, over sodium amalgam.

BIRMINGHAM GAS DEPARTMENT'S EXHIBIT.

The Bingley Hall Display.

RECOLLECTION of the excellent displays of gas which had been made on previous occasions at the National Trades Exhibition, which takes place annually in the commodious Bingley Hall at Birmingham, induced the writer, when unexpectedly finding himself in the city on a recent Saturday evening, to pay a visit to the exhibition, in order to see for himself what has been done this year to demonstrate the capabilities of gas. And let it be stated at once that the feeling engendered by the inspection was one of great satisfaction. Though independent gas apparatus manufacturers are not separately represented (with the exception of engine makers) as they have been on some recent occasions, the Birmingham Corporation Gas Department make a really excellent show, which is bound to prove highly profitable to them from a business point of view—more especially when it is remembered that the exhibition is not an affair of a few days, but remains open for about a couple of months, during which time the many popular attractions that it embraces serve to irresistibly draw very large attendances. Indeed, on the evening of the visit the hall was even uncomfortably crowded; and though Saturday is probably the busiest day of the week, it is fair to assume that the patronage on other days is proportionately satisfactory. By the time the exhibition closes at the end of May, there should be few Birmingham people able to say they have not been to it at least once; and, of course, great numbers of visitors will have been drawn from surrounding districts. Thus in benefiting themselves the Birmingham Gas Department must be benefiting others also. This is a highly gratifying reflection; and it is one which, in fact, can rightly be indulged in by all who undertake gas displays in circumstances of this character, which appeal to the general public. Everything at Bingley Hall is well arranged, and the music is of the best; so that while the eye is pleased, the ear is tickled—and incidentally, it may be remarked, with reference to some of the stands, the palate is tickled also.

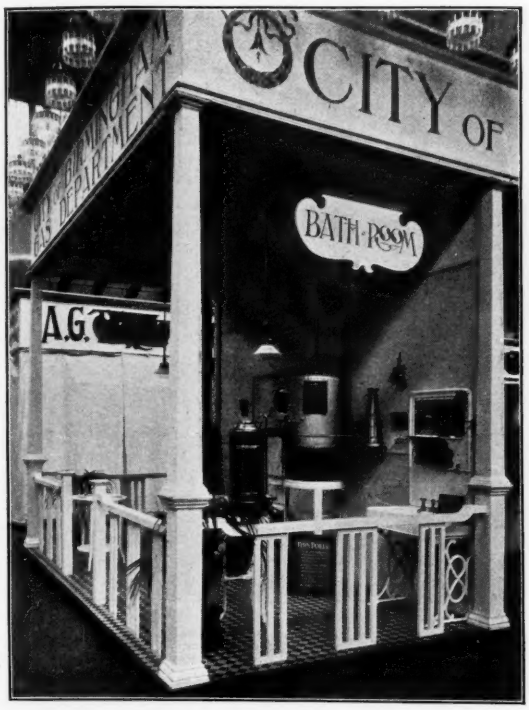


The lighting of the exhibition, as usual, is quite one of the features. The whole of it is on the high-pressure system, from the Corporation mains. In the body of the hall, there are 45 1000-candle power lamps of different makes, and two 4500-candle ones; while in the gallery there are 58 300-candle lights. No globes are used for the lamps; but a wire protecting guard is fitted underneath the burner, to prevent any possible damage being done by a mantle-ring falling down—an accident which, however, has not yet occurred. Some of the individual stands are provided with effective gas-lighting arrangements; and at the entrance to the exhibition there are a couple of 4500-candle power high-pressure lights. The Gas Department's exhibit is very brilliantly illuminated by sixty 300-candle power high-pressure "U.K." gas-lamps, all fixed at one height round the top; and to these are attached beaded fringes of a very pretty pattern.

Under these conditions, the display is seen at its best; and some account of it may be prefaced with the remark that it was noticed that the latest literature of the British Commercial Gas Association was very freely distributed about—thus furnishing proof of the usefulness of publications of this character emanating from a central source. The stand of the Birmingham Gas Department occupies a central position near the entrance door, and is on the present occasion larger than hitherto—being 42 feet long by 16 feet wide, divided by a central gangway, so that the public are able to pass through. On one side of the gangway there is a kitchen, furnished with the latest types of gas apparatus for use in the home. The range is a combined gas fire and cooker, incorporating an arrangement whereby the waste heat from the gas-fire is utilized for heating water in a boiler placed above the fire. Gas-irons naturally find a place, as does also a new cooker, with enamel linings, which the department are just putting on the market, and which can be obtained on simple hire or hire purchase, or bought outright. Provision for the supply of hot water is exemplified by a Wilsons and Mathiesons circulator; and an important direction in which gas can be of use in the home is shown by the presence of wash-boilers.

On the other side of the gangway is a tastefully decorated and furnished lounge, wherein is a handsome "Kenilworth" fire, of dog-grate type, by Messrs. John Wright and Co. This is in a tiled recess, and surmounted by a mahogany overmantel. The oak panelling well sets off the artistic "Candela" brackets; and here it should be pointed out that the whole of the lights on the stand are operated from a switchboard placed on a table in the lounge. The valve arrangement for lighting and extinguishing is incorporated in the fittings, and so escapes notice. The valve is of the diaphragm type, on the pneumatic principle, similar to that which is used in the new gas offices at the Birmingham Council House, a description of which has already been given in the "JOURNAL." In addition to the wall-brackets, there are a standard lamp and a pendant of the "Surprise" pattern. The two lamps in the gangway are of the Sugg three-burner pattern, which are supplied by the department to customers on hire-purchase terms. The charge made is 7s. 6d. per quarter, which includes fixing and re-mantling, for three years. At the end of this period, the lamp becomes the property of the consumer, and the Corporation undertake to maintain it at the usual maintenance rates. A large number of the lamps have been supplied by the department on this basis during the past eighteen months. The lamps in the central gangway, just referred to, are fitted with opal lettered screens, which are very popular with the shopkeepers in Birmingham for day and night advertisements.

Coming to the third, or bath, section, there are here neat pendants, with the operating valve constituting a part of the fitting, in the same way as has been mentioned above in connection with the lounge. The decorative scheme is all white; and the public can witness at work here the "Sun" boiler, as well as various types of geysers. A Fletcher Russell "Instantaneous" water-heater is fitted over the lavatory basin; and there is also a Maughan "Pearl" geyser, and shampoo-rose. Various intimations of a useful character are exhibited, in order that "those who run may read;" and these are all nicely framed so as to catch the eye. Any semblance of crowding has been avoided—the aim



being not to show a big range of apparatus, but simply a practical bath-room, which would be likely to appeal to the public. One little convenience that deserves mention is a copper shaving-mug fitted over a bunsen burner. This is an appliance that can be put up in any bath-room or bed-room, and exactly meets the case where only a small quantity of hot water is required, with a proportionately little expenditure of gas. Notice has already been taken of the presence in abundance on the stand of the latest literature of the British Commercial Gas Association; but it should be added that this is supplemented by various well-got up publications prepared by the department themselves. A good idea is the inclusion in a single illustrated list of all the gas cooking and water heating apparatus hired out by the department.

The fourth, and last, section of the stand, and the one which faces the exhibition entrance, is that devoted to high-pressure industrial gas appliances. This is lighted by two Keith 300-candle power lamps; and in the centre is erected, and in working order, a high-pressure lead melting-pot, suitable for melting lead, tin, zinc, or silver. Lead, it is stated, may be melted in the furnace at a cost of 6d. per ton. Several furnaces of this type are now in use by different manufacturers in Birmingham. The absence of noise is a particular feature of the use of high-pressure gas in this direction; and it has been found from actual working in Birmingham that higher efficiencies can be obtained by using

high-pressure gas in this furnace than can be secured by low-pressure gas for similar work. Considerable interest is manifested in a jeweller's board, similar to those which are employed in connection with the working jewellers' trade in the city. It is fitted with a special form of side-light, and various kinds of blow-pipes. Then there is displayed an annealing furnace, suitable for use with town gas at ordinary pressure; and with this, it is intimated, brass stampings may be annealed at a cost of 1½d. per cwt. Another piece of apparatus well adapted to special Birmingham industries is a gas-heated oil tempering furnace, for tempering springs, pens, &c.; and there are also a Brayshaw twin-chamber furnace, and a tinman's stove for heating copper soldering bits supplied with burners for high-pressure gas. From a series of interesting photographs displayed on the stand, it is gleaned that a Lehr oven for annealing glass, heated by the town gas at ordinary pressure, has been erected on a large scale; and there is also illustrated a "glory hole," used for glass work, heated by high-pressure gas. One cannot look at this portion of the department's exhibit, and the quantity and variety of apparatus, without reflecting on the enormous scope for the application of gas to industrial purposes, in a city like Birmingham.

In conclusion, it may be remarked that the stand (for the accompanying illustration of which we are indebted to Mr. S. R. Barrett, the Fittings Superintendent of the Birmingham Corporation Gas Department) is well staffed from the commercial side of the business, so as to render inquirers every assistance in understanding the uses and economy of the appliances on view.

*** The excellent photographs from which the accompanying illustrations were prepared were taken by Mr. J. Hewitt, of the Bingley Hall Exhibition.

HIGH-PRESSURE GAS AT NEWCASTLE.

A SYSTEM of high-pressure gas has just been installed at Newcastle by the Newcastle and Gateshead Gas Company, by which gas is put under pressure for both transmission and lighting by the one set of compressors. Included in the extensive alterations which are at present being carried out at the Elswick works by Mr. Thomas Hardie, the Engineer to the Company, is a compressing set, which when finished will house four compressing units. At the present time there are three units, capable of handling a total of 45,000 cubic feet of gas at 20 lbs. per square inch. A fourth compressor is in course of construction (it will be working within the next few weeks) which will be capable of handling 40,000 cubic feet of gas at 20 lbs. per square inch. All the compressors have been built by James Milne and Son, Limited, of Edinburgh.

All the compressors are of the steam-driven reciprocating type, having the gas cylinder in tandem with the steam cylinder. Each compressor is water-jacketed, and has an adjustable relief-valve arrangement which passes any excess of gas to the suction side when the compressor is running at its minimum speed and is still compressing more gas than is required. This relief-valve also acts as a safety should the compressor be started with the valves closed. The suction valve of the compressor is of the positive type, and a unique use is made of it, as it actually discharges compressed gas through the discharge valves when opening the suction port. By this means, very small cylinder clearances are obtained. The two discharge valves are of the automatic type especially adapted for use with gas. The pistons of both the steam and gas cylinders are mounted on one piston rod, and are so designed that the rod can be withdrawn from the back end of the gas cylinder. Two extra heavy flywheels are mounted on the engine crank-shaft, which enable the compressors to run at about one-sixth of their normal speed. The steam cylinder is fitted with a Pickering governor, set to prevent any abnormal speeds, a specially designed pressure governor speed-controller which is adjustable, and a steam stop-valve.

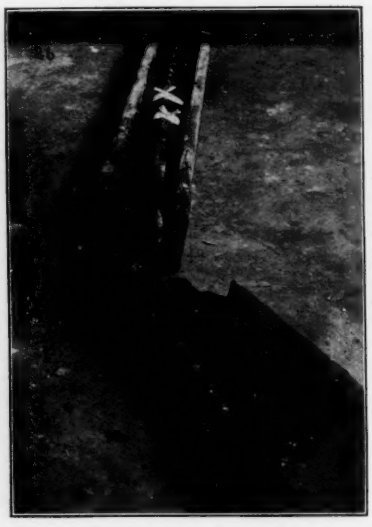
The general dimensions of the compressors and engines are:

Capacity of Compressor.	Gas Cyl. Dia.	Steam Cyl. Dia.	Stroke.	R.P.M.	Dia. of Fly-wheels.	Overall Lengths.	Overall Breadth.
	In.	In.	In.		Ft. In.	Ft. In.	Ft. In.
5,000 . .	9	8	9	160	4 6	10 9	3 9
15,000 . .	13	11	15	140	4 6	15 5	4 9
25,000 . .	16	13	17	130	4 6	14 6	5 3
40,000 . . (building)	19	15	21	120	5 6	17 2	6 4

The gas, after leaving the compressors, is carried to two large receivers situated over the engine-room. From the receivers, two supplies are taken—one to a 6-inch Reynolds governor (by the Bryan Donkin Company), where the pressure is reduced to 80 inches water column. This supply is for the high-pressure town service; and there is both high-pressure street and shop lighting. The second supply is for purposes of boosting. It is carried through about three miles of 8-inch and 6-inch pipes to a district where the pressure was not up to the full requirements. There it is reduced-down to ordinary low pressure by another Reynolds governor. The pressure is maintained on the mains day and night. When the compressor at present under construction is completed, the installation will have a total capacity of 85,000 cubic feet per hour.

ELECTRIC CABLE GAS EXPLOSION AT HEBBURN.

Damaged Electric Cable Trough, as first exposed, with earthenware tile covering only removed.



The Bend in the Trough, showing how the Cables were found one over the other (instead of parallel) at the bend.

After the Carbonized Bitumen had been removed, and the remainder of the Cable replaced, six feet of the negative cable was missing.

THE BITUMEN GAS GENERATED BY, AND FIRED BY, A FUSED ELECTRIC CABLE.

PHOTOGRAPHS which have been forwarded by Mr. T. H. Duxbury, the Engineer and Manager of the South Shields Gas Company, show the great amount of damage done to property by the fatal explosion that occurred at Hebburn-on-Tyne. Altogether four houses, comprising eight flats, were damaged; the actual explosion having taken place in the front room on the ground floor of a corner house. The two unfortunate victims were in this front room, the appearance of which after the explosion was remarkable—practically the whole of the contents having been smashed to atoms. At the inquest, the Jury found that the explosion was caused by bitumen gas generated by a fused electric cable. Mr. Charles Vernier, the Mains Engineer of the Newcastle Electric Supply Company, in the course of his evidence at the inquiry, pointed out that the fusing would be greatest at the bend in the cable; and this would set up a tremendous heat, which caused the bitumen to give off a gas. This gas, when mixed with air, he added, would be of an explosive character; and possibly the intensely high temperature of the gas caused the mixture to fire. The accompanying photographs of the damaged cable and wooden trough will be found useful in illustration of the various points made by witnesses at the inquest.

IMPERIAL COLLEGE OF SCIENCE & TECHNOLOGY

Inspection of the Work.

INVITATIONS were issued some time back to members of the Technical Press to view the various departments of the Imperial College of Science and Technology, South Kensington. The visit took place last Tuesday, and was preceded by a luncheon at the Imperial College Union, at which were also present the chief Professors of the College.

Presiding at this function the Rector, Sir Alfred Keogh, remarked on the interest attaching at the present time to questions of education in London, in view of the recent report of a Royal Commission on the subject (which, by the way, recommends a union of the Imperial College with the University of London). He wished the objects of the College to be made more generally known, as well as the good work that was being accomplished there. The large and important extensions which had been, and were being, made, resulted in the institution being the largest engineering college in the country. It was not only large, but could also provide an excellent education, and it was to be hoped that it would do much towards altering the false idea that it was necessary to go out of England, in order to have first-class scientific qualifications. This College was every bit as good as such famous universities as Charlottenburg. He would call special attention to the botanical section, in which the most important research work was carried on, at the same time pointing out the vast importance of economic botany to this nation. He hoped that the visitors would see for themselves, during the inspection, the excellent work that was being done. Mr. F. G. Ogilvie, a member of the Executive Committee, said he would like to add a few words to the remarks of the Rector. The College, which, as such, was still in its infancy, offered greater advantages to its members than had the three individual institutions in former days. For it was only in 1907 that the College had been formed by Royal Charter, by the association of the Royal College of Science, the Royal School of Mines, and the City and Guilds (Engineering) College. The advantages afforded by such a large and united college must be clear to all.

On the conclusion of luncheon, the party split up into sections, and the various Professors took charge of those specially interested in their particular departments. The College is divided into five main sections—Botany, Mining, Metallurgy, Chemistry, and Engineering—and naturally there is scope for a certain amount of subdivision and specialization in all these branches. Although mining, metallurgy, and engineering have all a certain interest for our readers, the part that is of most importance to the gas profession is the Fuel and Refractory Materials Department of the Chemical Technology Branch. This is at present in temporary quarters, while a splendid new building is being erected for its reception. It is in the capable hands of Professor W. A. Bone, and students must have three years' training in the elementary chemistry department, or the equivalent elsewhere, before they are allowed to devote themselves to the more advanced work. In the new building there will be ample room for a wide range of study and research. On the ground floor are to be an analytical laboratory, a gas-producer plant, a refractory materials analysis and research room, and a small gasholder for storing gas for experimental purposes. On the first floor are to be a furnace room, with foundations on which experimental furnaces can be built up as required, apparatus for delivering gas, air, or mixtures at any required pressure, facilities for combustion research, and a photometer room in which flame experiments of all kinds can be carried out. At some later date it is intended to add two more storeys. But it will be seen that, even with the accommodation as at present projected (which should be complete in a year from now), a tremendous amount of useful work will be able to be done. It is intended, in short, to do as much for the gas industry in the South as Leeds does for it in the North—if not more.

Mr. Henry Woodall.—The current number of the "Co-Partners' Magazine" of the Gaslight and Coke Company has for frontispiece a portrait of Mr. Henry Woodall, the new Director of the Company; and in the text referring to it a hearty welcome is accorded to him on behalf of the co-partners.

Mr. Goulden's Eastern Counties Association Paper.—In Mr. Goulden's communicated reply (p. 326) to the discussion on his paper at the meeting of the Eastern Counties Gas Managers' Association, he inadvertently stated that "the cost of £114 per ton per day includes," &c. This, of course (as shown by the paper), should have been £114 per 20-feet through retort, and not "per ton per day."

Mr. J. P. Hallaway.—In the paragraph last week referring to the Engineer of the Singapore Gas-Works (and founded on the report noticed on p. 347 of the same issue), it was by mistake stated that he was about to take a holiday home. As a matter of fact, he left on a visit to Europe on the 4th of April last year, and is now back in Singapore. He started from London on the 13th of March, by the P. and O. special steamer, for Marseilles.

CRITICISMS OF RECENT PROPOSALS CONCERNING GAS-FIRE CONSTRUCTION.

By H. James Yates, F.C.S., Chairman and Managing Director of John Wright and Co., of Birmingham.

Some months ago a communication appeared in the "Journal of Gas Lighting" suggesting a new test for the "hygienic efficiency" of gas-fires. At the same time those interested in the proposed test sought to lay down a certain standard of "hygienic efficiency" to which all gas-fires should conform—viz., such that, without the aid of any flue attachment whatever, all the products of combustion shall pass away through the flue outlet and no escape of any products shall take place from under the canopy.

Further, it was asserted by the proposers of the suggestion, that they had actually put on the market a fire which successfully passed this self-imposed "standard"—being so constructed that "*the space allowed between the front edge of the canopy and the refractory mantles is carefully proportioned to allow a large volume of ventilated air to be drawn into the flue without in any way affecting the radiant efficiency of the fire.*" ["Journal of Gas Lighting," July 30, 1912.] And, finally, it was stated (on their behalf) that in "*their opinion, founded on extended tests, these fires represent the most efficient and hygienic series ever placed on the market.*"

Such claims being, in the circumstances in which they were advanced, obviously intended as a challenge to all other makers of gas-fires, I felt compelled, as the principal of a firm who, in respect of either present output or length of experience and pioneering efforts, are entitled to regard themselves as *nulli secundus*, to take up the matter as one of prime and pressing importance.

Accordingly, I submitted to investigation several fires which these makers had constructed to pass their proposed new standard of "hygienic efficiency;" and from a study of these fires, as well as from the descriptive article upon them which appeared in the "Journal," I found that the distinctive features of their construction (none of which are new) are briefly:

> (1) An oval flue outlet. (2) The placing of this outlet at the highest point of the canopy chamber, and other arrangements for securing the entire absence of pockets in the canopy. (3) The extension of the canopy, and its prolongation downwards, so that it nearly overlaps the top of the radiants.

As regards (1), we ourselves have advocated and provided such flue outlets for years, and several other makers now supply them. The next feature (2), although insisted on as a necessary condition, is not carried out in its entirety, for all their fires certainly have "pockets." The remaining principle (3), to which the fires in question mainly owe their ability to pass the proposed new standard of "hygienic efficiency," consists in the (as I had hoped) discarded plan of bringing the canopy down to the radiants, and is, in my judgment, a decidedly retrograde step, inasmuch as such a construction necessarily compels the cold "ventilating" air, which is drawn in under the canopy, to pass directly over and through the radiants—thus cooling them and impairing their radiant efficiency.

In any fire some heat must, of course, be sacrificed in doing the useful work of getting rid of the products of combustion and of assisting in ventilating the room. But when this is mainly effected (as in the proposed new construction) by unduly prolonging the canopy downwards, until it nearly overlaps the top of the radiants, more heat escapes up the flue than is necessary for these purposes; and, inasmuch as the *unnecessary* part of such loss arises through the cooling of the radiants by the draught, it follows that such loss must chiefly be at the expense of the most important part of the fire's efficiency—namely, its *radiant* efficiency.

Such being the great drawback from which any fire with a canopy unduly prolonged downwards must (provided it has a sufficiently large flue) suffer, I was not at all surprised, on submitting the new fire in question to comparative tests with others of our own and other makers' construction, to find that while satisfying the proposed new standard of "hygienic efficiency," they were not only deficient in radiant efficiency, but also much more susceptible than others to progressive diminution of radiant efficiency under conditions of increasing flue draught. The evidence of my own experiments, in regard to these points was so unequivocal and convincing, that I felt justified—not only in the interests alike of makers and users of gas-fires, but also in the widely important interests of gas progress—in protesting against the claim made for the fires in question that, while complying with the proposed new hygienic standard, they do so "without in any way affecting the radiant efficiency of the fire." I protested against this claim both on the grounds of invalidity, and also because of its connection with an unfair (because *ex parte*) attempt to "rush" a new "hygienic standard" upon a great industry, and the public, without due warning or adequate and impartial consideration.

When I ventured, after careful investigation, to dispute this claim made on behalf of these fires, and to state regarding them that seeing they carried off all their products without being attached to a flue, they would, when the chimney draught came into play, inevitably carry off more than the products—to wit, an unnecessary number of heat units as well—the makers concerned called insistently for proofs of my statement. I had, of course, my proofs; but, lest, being interested, I should be thought to be biassed, I deferred replying to the challenge till I should have submitted the matter to some independent and impartial authority.

Accordingly, I consulted Professor William A. Bone, who, after consideration of the history and circumstances of the case, consented to investigate the main issue as a scientific problem, without bias and prejudice, on two conditions—namely: (1) That he should not be expected or called upon to express in public any opinion as to the relative merits of fires of our own or other firms' manufacture; and (2) that, in the event of his investigation disproving our contention, we would willingly admit our error.

The issue which Professor Bone undertook to investigate experimentally was really twofold in its bearings—namely: (1) Whether, in his opinion, our view of the proposed new construction, as above set forth and expressed, is justified by ascertained facts; and also (2) whether, in the event of our view not being so justified, he would consider it desirable that the present designs of gas-fires generally ought to be modified in the direction recently advocated.

Professor Bone has summarized his conclusions in the following report:—

London, April 19, 1913.

To Messrs. John Wright and Co.,
Essex Works, Aston, Birmingham.

Gentlemen,—The experimental investigation upon which this report is based was carried out at your Essex Works under my direct superintendence, and extended altogether over a period of nine days.

All observations or records in connection therewith were either taken or checked by myself and assistants; and the whole of the subsequent calculations and conclusions were worked out by myself and assistants entirely independently of, and without the knowledge of, any member of your staff.

Needless to say, I have, in accordance with the terms of your commission, investigated the matter from a strictly impartial and unprejudiced standpoint; and my conclusions thereon are based solely upon the facts disclosed by the said investigation, and without reference to any other previous results or arguments.

The simplest and most direct way of arriving at a sound judgment on the matter was to submit two fires, of as nearly as possible the same capacities and dimensions, but of different construction as regards depth of canopy and distance between bottom edge of canopy and top of radiants, to careful comparative tests, under varying conditions of draught, in such a way that the advantages, or otherwise, of the new principles of construction recently advocated in the Technical Press, would become manifest.

With regard to the two main issues upon which I undertook to give an opinion, my conclusions are as follows:—

> (1) The experimental results, taken as a whole, leave no room for doubt that your contention with regard to the new claims is well-founded; for I found that, in the case of both fires tested, an increase in the ventilating effect was only gained at a certain sacrifice of radiant efficiency, which sacrifice was more marked the less the distance between the lower edge of the canopy and the top of the radiants—in other words, as in the new construction advocated.
>
> (2) Nothing has been brought to light during my investigation which would justify me in recommending any modification of the design and construction of your fires in the direction recently advocated in the Technical Press.

My investigation has also disclosed the fact that, whilst the new construction advocated does effect the complete discharge of the products of combustion through the flue vent, without any flue attachment, it does not necessarily, on that account, give a better ventilating effect than the other type of fire examined, when both are working under the same condition of flue draught—in fact, quite the opposite is the case.

I have the honour to be,
Yours faithfully,
(Signed) William A. Bone.

It will thus be seen that Professor Bone's conclusions justify the position which we have taken up in this matter. The present controversy was not of our seeking, but was forced upon us by the repeated public challenges made to us by the firm in question, and also by the fact that they have, at demonstrations given by them throughout the country, systematically used our fires as examples of improper construction. We have felt it incumbent upon us, in the interests of makers and users of gas-fires, as well as in those of gas progress, to question the validity of the claims made for gas-fires of this construction; and I am confident it will be generally recognized how completely the results of Professor Bone's independent investigations have vindicated our attitude in the matter.

Control of Water.—Messrs. George Routledge and Sons, Limited, of Carter Lane, E.C., announce their intention of publishing during the present month a work on "The Control of Water, as Applied to Irrigation, Power, and Town Water Supply Purposes," by Philip à Morley Parker, B.A. (Cantab.), Assoc. M.Inst.C.E., &c. It will be a volume of 1064 pages; and the text will contain some 300 sketches and diagrams. The author believes that a great deal of the information contained in the book is either new, or has never been presented in an accessible form; it being mainly based upon a collection of notes and formulæ accumulated in some eighteen years of professional work. All the sketches have been specially prepared; and in many cases the drawing suggests a partial specification for material and workmanship. The price of the book will be 21s. net, or 21s. 6d. post free.

THE GLOVER-WEST VERTICALS AT LURGAN.

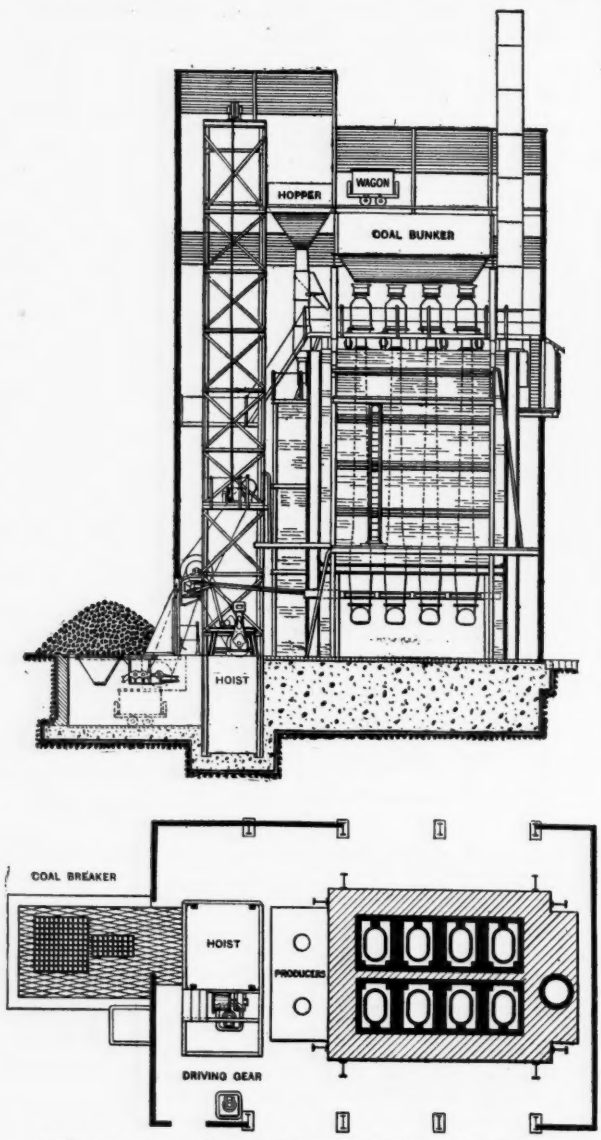
Favourable Working Results of the System.

In view of the fact that the installation of Glover-West vertical retorts erected at the works of the Lurgan Gas, Light, and Chemical Company have been in operation a sufficient time to permit of a full twelve months' working comparison being made with the horizontals which they displaced, the following particulars, supplied by Mr. Wilfred Tallentire, the Manager of the Company, are of considerable interest. Readers may be reminded that a photographic illustration of the plant at the then stage of completion was given in the "JOURNAL" for May 2, 1911, p. 283.

For some time previous to 1910 our carbonizing plant (retort-house included) was falling into very bad repair. As vertical retorts were then coming so prominently to the front, I thought I might be able to introduce them here; so wrote to the representative of a prominent system with this object in view. His reply, however, was not by any means encouraging. Still, I felt sure that I was on the right lines; and as I could make the old plant last a little longer, I determined to wait.

Shortly after this, the results of the working of the setting of verticals at St. Helens on the Glover-West system, with a description of the plant, appeared in the "JOURNAL;" and I was so convinced that this was what I had been seeking, that I wrote to West's Gas Improvement Company to see if they could make a plant suitable for a works of our size. They went into the matter and soon had a scheme prepared which I laid before my Directors. The absolute newness of the idea, coupled with the fact that it had not then been tried in this country, rather startled them; but after grave consideration they were persuaded to visit St. Helens. It was then only a matter of time till a contract was placed with West's Gas Improvement Company for a complete installation of vertical retorts on the Glover-West system.

The plant includes the following: A setting of eight Glover-West vertical retorts heated from two producers placed at the end. Each producer serves four retorts, any one of which may be, by means of dampers, &c., put on and off as required. The arrangements of the feeding and discharging apparatus is similar to other plants of the same system, descriptions of which have already appeared in the "JOURNAL" from time to time. The coal is broken by breaker and elevated in special tipping waggons by means of a hoist to the overhead bunker, which has a capacity for twenty-four hours. The driving gear for the coke extractors and coal plant is actuated by steam-engines.



Section and Plan of the Glover-West Vertical Retort Installation at the Lurgan Gas-Works, with Setting arranged in Units of One Retort each.

The plant was first of all put into operation in August, 1911, and shortly after the horizontal retorts were thrown out of action, and have since been demolished. The working of the installation has been very satisfactory from the start, and the "units" quite suitable for the works requirements. Tests were taken from time to time. These showed increased results over the old system; but owing to the coal strike, reliable comparisons could not be made for the first six months, as "spot" lots of coal were bought to tide the works over till supplies were normal. In fact, about 17 to 18 per cent. of the coal used during the year now ended was bought during the strike period; and, needless to say, the bulk of it was coal in name only. Notwithstanding this loss, the results have worked out much better than was anticipated, as the following comparison of both systems will show.

—	Horizontals, 1911.	Verticals, 1913.
Coal carbonized per annum . . tons	4,316	3,958
Gas made . . . . . cubic feet	44,513,500	47,031,600
Gas made per ton of coal carbonized . . . . . cubic feet	10,313	11,882
Coke for sale per ton of coal carbonized . . . . . cwt.	7·78	9·00
Carbonizing wages	£431 0 11	£234 10 2
Do., per ton of coal carbonized . .	2s.	1s. 2·22d.
Illuminating power.	18 candles	16 candles

In reference to the carbonizing wages, the rate of pay has advanced 20 to 25 per cent. since the plant was installed, otherwise there would have been a saving in this item alone of somewhere about 50 per cent.

As has been already stated the plant is manufacturing the whole of the output; and when it is remembered that all holidays and "full moons" are rigidly observed here, it will be seen how this varies considerably. The flexibility of the setting is such, however, that these varying demands are easily dealt with; the make being altered as required by the arrangements provided for controlling the "heats," and the speed at which the coal is passed through the retorts.

Previous to the introduction of verticals a great deal of trouble was experienced through stoppages caused by naphthalene, not only in the works but over the whole lighting area. This has now entirely disappeared, and is a thing of the past.

I may say that West's Gas Improvement Company are unique as contractors and were more than careful to thoroughly fulfil all their guarantees.

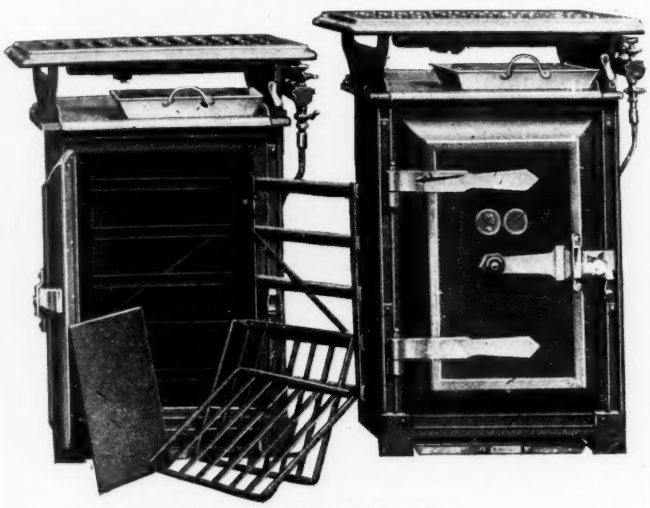
My Directors have always been anxious to progress. All of them are largely engaged in the staple industry—linen manufacture. This spirit of progress also applies to the local Town Council who were first in this country to have the whole of the town lighted automatically on the pressure wave system.

THE "HOUSEWIFE" COOKERS.

For the new series of gas-cookers which they have placed upon the market, Messrs. Fletcher, Russell, and Co., of Warrington, have selected a good name, in calling them the "Housewife." But in making this remark, it is not, of course, intended to suggest that the name is a weighty consideration in connection with so important a branch of domestic economy as the cooker. By no means. It is only when applied to a good article that a good name calls for notice. That this combination exists in the case in point, will be admitted on careful inspection of the firm's new cookers; and therefore it is not amiss to compliment them upon the choice of a title.

When it is remembered that the 1913 series are the outcome of experiments by Messrs. Fletcher, Russell, and Co. extending over a period of more than thirty years of practical cooking apparatus manufacture, it is not surprising to find that the "Housewife" cookers are carefully constructed on those sound scientific principles which are necessary to give satisfaction in use—resulting

as they do in the best cooking results with a minimum amount of trouble and gas consumption. The object has been to design a highly efficient cooker, without the introduction of any unnecessary complications. All the latest useful improvements in cooker construction have been incorporated. For example, there are swing-out shelf-rests, enabling easy cleaning, and presenting no obstruction to the passage of heat up the sides of the oven; all the burners, both in the oven and on the hot-plate, are removable, and provided with gas-adjusters; and the sheet enamelled linings to the oven can be had either removable or fixed. There has been provided for the series a boldly designed door, with ground and polished mouldings, hinge bands, and latch; while an advantage



The "Housewife" Cooker Series.

in detail is the shaping of the back of the hot-plate so that the cooker can be placed close up against the wall. Where desired, the series can be had fitted with the firm's patented arrangement at the back of the hot-plate, by means of which the bars, when raised, are held in an upright position while the burners are being cleaned. Then it was noticed that one, at any rate, of the cookers which were examined was fitted with a straight burner, running parallel with the hot-plate bars, so that the whole of the flame, without obstruction, can be utilized to heat a flat-iron. This, it was gathered, is regarded as preferable to cutting a square out of the hot-plate bars.

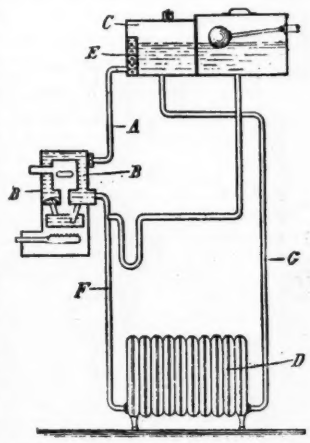
The new series is a comprehensive one, for it is arranged in five progressive sizes—the smallest being sufficient to adequately fill the requirements of two or three persons, while the largest will easily meet the needs of a family of fifteen. As to workmanship and style, it is unnecessary to say more than that they are worthy of the excellent reputation in these respects which has for long been enjoyed by the firm. In short, the series is one which looks good, is good, and last, but not least, has attractions from the price point of view. It should thus appeal alike to consumers and to gas undertakings. For hiring-out purposes, a uniform series of cookers of graduated sizes has, of course, its advantages.

Though not connected with the subject of cookers, it may be remarked here that when in Messrs. Fletcher, Russell, and Co.'s Queen Victoria Street show-rooms, it was seen that they are fitting their fires with a new fuel, which is of a nice regular design, and is looked upon as a great improvement on what the firm have hitherto been supplying. It is of pillar shape, and those who desire it can have a row of fuel laid along the top of the pillars. To meet the requirements, however, of persons who do not want to have this top row, the pillars are finished off with a centre bar in the fuel, so as to break-up the flame.

A NEW CIRCULATING SYSTEM.

A SIMPLE means for attaining a desirable end has been patented by Mr. H. T. Fenlon—after consideration and investigation, which were begun somewhere about four years ago. What has been specially aimed at—and what, it may be added, has been accomplished—is, in a hot-water circulating system, to be able to satisfactorily circulate water below the boiler; it having been felt by Mr. Fenlon that in many circumstances it would be an advantage to provide an arrangement with which the boiler could conveniently be placed above the level of the radiators, &c., to be heated. There are also other advantages attached to the invention, not the least of which is inexpensiveness of installation.

The idea of the system will be understood from the illustration, in explanation of which it may be stated that pipe A leads from the upper part of a boiler B to a distributing tank C, placed at a higher level than the boiler, and above the radiators D or other appliances to be heated. The pipe referred to communicates with the tank (which is of a closed character), and has at its end, inside the tank, a rose or perforated hollow box E. From the lower part of the boiler, a pipe F runs downward to preferably the bottom part of the lowest radiator (when there is more than one); while from the water-tank to the top radiator there is a pipe G. Provision is made for a suitable air or steam vent appliance, in case of a too great pressure being reached; and the radiators at the different levels are connected by piping, so as to afford complete circulation. In action, the heated water from the boiler rises up the pipe to the distributing tank, into which it issues at a rapid rate in streams through the perforations in the rose or nozzle, causing an ebullition in the tank, and consequently a pressure which acts upon the water in the flow pipes, and forces it down through them and ultimately to the boiler. In this way, it is claimed, there is ensured a rapid circulation, and therefore quick heating; while every radiator is of equal heat at all parts. Draw-off taps may be placed where required, and other arrangements made to enable the hot water to be used for domestic purposes, as well as for heating.



Fenlon's System of Heating by Water.

Mr. Fenlon is anticipating a good future for the invention in factories, places of amusement, &c., and in offices with no basement, where the boiler could be placed near the ceiling, on a floor above, or anywhere out of the way. As to the question of cost, it is pointed out that, as the method results in the circulation being much quicker than with the ordinary gravity system, where it would be necessary in the latter case to have (say) a 3-inch pipe to secure sufficient heat, Mr. Fenlon is able to obtain the same result by means of a 1¼-inch one. The action of the rose arrangement in the tank is virtually to throttle the water supply, and prevent it from going into circulation until there is sufficient pressure behind it. To inquirers, Mr. Fenlon is able to show, on the premises of his firm at No. 8, Tudor Street, Blackfriars, an installation in which the tank is not more than 9 inches above the boiler, and he has a drop of 25 feet from the tank—and maintains that he could have a drop of another 100 feet if necessary. The basement, offices, and show-rooms are all warmed from this system, in which there is about 100 feet of ¾-inch pipe; and with a gas consumption which is stated to be 27 cubic feet per hour, the writer saw a temperature of nearly 180° registered about 25 feet from the boiler on the flow-pipe. The pipe goes direct from the tank to the basement, along which it runs, and afterwards passes up to two radiators, &c. There are all sorts of bends; but these are found to make no difference to the circulation. In fact, the installation has proved satisfactory in every respect. It will, of course, be noted that there is in the apparatus nothing whatever to get out of order.

WOOD PRESERVATION WITH WATER-GAS TAR.

A PAPER on the above subject was submitted by Professor FRANK C. MATHERS, of the Indiana University, and Mr. J. N. MONCREIFF, at the last meeting of the Indiana Gas Association. The following are some extracts from it.

The treatment of timber with preserving materials is of the greatest value in the conservation of the forests of America. Only half as much timber will be required if it can be treated so that it will last twice as long. Many abundant but inferior woods which have been considered worthless can be treated so that they will be as permanent as the more expensive and the scarcer timber. The loss of timber through decay averages 81 per cent., against 19 per cent. for all other destructive agents, such as fire, insects, marine borers, and mechanical abrasion.

The cause of this decay is the growth of bacteria and fungi—low forms of plants—which require for their development air, water, heat, and food. The removal of any one of these conditions will prevent the development of the fungi, and the decay will be arrested. Any kind of wood will be free from decay so long as it is dry; for moisture is one of the most essential requirements for the growth of the fungi. The wood contains abundant food for the fungi, while air and sufficient heat are always present in all ordinary cases where timber is used. Where timber is not in contact with the ground, the water is so quickly evaporated that decay is not rapid. However, near the ground, moisture is always abundant, and decay is rapid. To prevent decay, moisture and food for the fungi must be eliminated, since it is not practicable to control the other conditions—air and heat. This desired result can be attained most easily in a commercial way by impregnating the timber with creosote oil, so that the food supply for the fungi is poisoned and moisture is kept out by the oil.

Creosote, more properly called coal-tar creosote, is the dead oils from the distillation of coal tar, or those oils having a specific

gravity greater than 1. It varies greatly in composition, and is perhaps frequently adulterated. Heavy oils from water-gas tar are said to be added. The value of the creosoting depends upon the antiseptic action of the creosote, and, to the largest extent, upon the waterproofing properties. In fact, after many years of service, creosoted timber loses most of its "creosote," but still contains the heavy oils which effectually keep out the water. This has led certain railroad companies in the West to impregnate ties with heavy asphaltic crude oils. Here the antiseptic action is almost totally absent, and all beneficial results depend upon the waterproofing. Water-gas creosote or water-gas tar will make the timber waterproof; but it is less strongly antiseptic than the coal-tar creosote. The methods of applying creosote, as generally followed, require expensive and elaborate plants; but it is possible to obtain good results with very simple or even crude methods.

The brush method is the easiest and least satisfactory of all. It consists in applying the creosote with a brush to the thoroughly seasoned and dry timber. This work should be done in hot weather, and hot creosote should be applied in two or more coats. It penetrates into the timber only a little way; and when this protecting shell is damaged, the interior of the timber begins to decay. An improvement over the brush method is to dip the timber. This has the advantage that it fills all the cracks and flaws with the preservative. Again the penetration is small, and the protecting action depends upon a thin shell.

Impregnation with creosote may be obtained by heating the timber in the preservative fluid in open tanks. The heating, which should maintain a temperature just above the boiling-point of water, causes the air and water in the wood to expand, so that a portion of this air and water is forced out. The rest contracts upon cooling—thus forming a partial vacuum into which the cold preservative is drawn. The heating should be continued for at least two hours, or, better, for four hours, with subsequent cooling for ten to twelve hours in the tank used for the heating, or cooling for two to four hours by standing in a separate tank of the cold preservative.

Only well-seasoned timber, from which all the bark has been removed, should be used. The bark tends to exclude the oil. Sap wood rots more readily than heart wood, because it more readily takes up water. In the same way, it takes up the creosote more readily, so it can be more easily and completely treated. Round poles, which are largely sap wood, may be more successfully treated than the split timber. In fact, the heart wood is so dense that it takes up very little of the tar.

In these experiments, round limbs or round sections of sugar maple, wild cherry, black walnut, sycamore, beech, and Michigan white cedar were heated in water-gas tar for four hours at a temperature of from 95° to 115° C. The tar, with the pieces of timber in it, was allowed to cool over night. In all cases the tar penetrated the sap wood and into the heart through all cracks or flaws.

The posts or pieces of timber should be completely immersed during the heating and cooling, since the tar is drawn in more readily through the two ends than through the sides of the timber. The following table gives the percentage, by weight, of tar absorbed, the number of gallons required for a post 7 ft. 6 in. long and 4 inches diameter at the two ends, and the value of the tar in each post, counting the tar at 3c. per gallon. One gallon of tar weighed 8·9 lbs.

Kind of Wood Treated.	Tar Absorbed, Per Cent.	Gallons of Tar for One Post.	Cost of Tar per Post.
Sycamore	65	4·0	12c.
Black walnut	168	3·6	11
Sugar maple	39	1·9	6
Beech	45	4·2	13
Wild cherry	48	2·4	7
Wild cherry	34	—	—

The beech and black walnut were already partly decayed. This accounts for their large absorption of the tar. Sycamore is the best wood to treat, since it absorbs the tar so readily. The Michigan white cedar pole was not completely covered by the tar during the treatment; so the figure for the percentage of tar absorbed is too low. The sap was completely filled with the tar; but the heart wood did not take up the tar except through cracks and flaws. It is possible to have as deep penetration with the use of less weight of tar by removing the timber from the tar when it is only partially cool. This is not advisable when a low-priced preservative like tar is being used.

Treatment of the butts of telephone or electric lighting poles would cost very little. Even painting with the tar would add years to the life of the poles. The cost of treating fence posts is very small, and no elaborate apparatus is required.

Tar is the very best paint that can be used for a shingle roof. The authors two years ago painted a barn roof with the tar. The shingles now have hard surfaces which keep out the moisture and prevent wear from the running water. This one treatment will no doubt add many years to the life of the roof. A repetition of the treatment every few years would make the roof permanent.

Everyone is interested in prolonging the life of the forests. Effective ways of promoting conservation is to make the forest products last longer, and to substitute the quick-growing woods, or the waste parts of trees, for the slower growing and scarcer timbers. A way of accomplishing this lies right at hand. The proper treatment of limbs of the sycamore, maple, &c., with water-gas tar makes fence post material which should last equal to any untreated timber. Shingle roofs, gates, and any other timber exposed to the weather, become very much more resistant to decay when painted with the tar.

RECOVERY OF THE NITROGEN IN COAL IN THE FORM OF AMMONIA.

An article appeared on this subject in the number of "Glückauf" for March 8, being a report by Dr. W. Heckel in connection with the German Coke-Oven Commission. As the question is of interest to gas-works as well as coke-ovens, we give an abstract translation of the article.

As is well known, the ammonia recovered has its origin in the nitrogen contained in the coal that is carbonized. This nitrogen was probably formed originally from the albumen of the vegetation which went to make the coal. Nothing definite is known of the form of the nitrogen in coal; the latest theory being that it is probably in combination with carbon. It varies from 0·5 to 1·5 per cent. in various kinds of coal. During the process of coking generally only a small part of it is volatilized, the larger portion remaining in the coke. Tests with eight different kinds of coal show that in one case four times as much remained in the coke as was volatilized; whereas in another case 63 per cent. was volatilized, only 37 per cent. remaining. So that it will be seen that conditions vary much with different coals. Therefore it is not right to judge the quantity of ammonia that any particular coal is likely to give from the amount of nitrogen in the raw coal. Moreover, not all the nitrogen that is set free can be recovered in the form of ammonia, for a large proportion of it is to be found as free nitrogen, or in other combinations, such as cyanogen or sulphocyanides. The ammonia production of coke-ovens is generally larger than that of gas-works, and the reason for this can be given later. Gas-works only use up 13·8 to 20·1 per cent. of the available nitrogen from Westphalian coal, 13·1 to 23·2 per cent. from Silesian, and 13·4 to 27 from English. It is of course important for coke-ovens, the author remarks, to produce as much ammonia as possible, and to keep down the quantity of free nitrogen. Conditions which favour the formation of ammonia are the presence of water in sufficient quantities; temperatures which are not too high, since ammonia is formed at about 800° C. and is already split-up at 100° higher; and, above all, rapid extraction of the gas from the carbonizing chambers, in order to avoid breaking-up of the compounds against the hot walls. It was found that oxide of iron diminished the amount of nitrogen remaining in the coke, and an attempt at using blast-furnace dust during carbonization was made. But this was found to work catalytically to the destruction of ammonia, and had to be abandoned.

It is well known that the formation of ammonia practically stops at the end of the period of coking. As then the gas production is also very weak, and there is always considerable back-draught in the furnace, which is apt to bring in waste gases and air, it is obvious that the oven should be shut down from the hydraulic seal. Whereas the formation of ammonia takes place mainly during the first hours of carbonization, the cyanogen trouble occurs somewhat later, as cyanogen is a secondary product from the passing of ammonia over hot coal. Therefore an increase in the output of cyanogen is always accompanied by a decrease in the output of ammonia, as is shown by the experience of gas-works, which always make more cyanogen than do coke-ovens. Another reason for the smaller ammonia production of gas-works is the dryness of the coal used. Coke-ovens, on the other hand, work with 12 to 15 per cent. of water in the coal, and the steam formed acts as a protection to the ammonia.

It would be a great advantage if a method were known of taking the nitrogen from the coke without combustion, or of reducing the quantity of free nitrogen in the gas. The use of lime has been suggested for the former case, but this gives coke of bad quality. The addition of steam has been tried; but this only reduces the temperature of the oven, and renders additional heat necessary. There are, however, one or two hints which it may be useful to remember:

1.—Coal should be evenly distributed in the oven, so that there are no uncovered spots which facilitate the splitting-up of the gas.
2.—The gas must be taken from the oven as quickly as possible.
3.—Ovens must be kept as air-tight as possible.
4.—The progress of carbonization should be observed by watching the composition of the gases produced.
5.—It is advisable not to work with too little moisture, as steam is some protection to the ammonia.
6.—Very high temperatures and rapid heating-up should be avoided, as they cause the formation of too much cyanogen, and the retention of too much nitrogen by the coke. Slower heating is best for the recovery of nitrogen in the form of ammonia.

The author concludes by remarking that, when the fuel is gasified, as for instance in Mond gas producers, far more nitrogen can be recovered in the form of ammonia—under favourable conditions as much as 60 per cent. or more.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting in Newcastle-on-Tyne.

THE Seventy-Second Half-Yearly Meeting of this Association was held on Saturday, in the Lecture Theatre of the Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne. The PRESIDENT (Mr. Charles H. Armstrong, the Secretary of the Walker and Wallsend Union Gas Company) was in the chair; and there was a large attendance.

The President welcomed the members very cordially, and made particular reference to the presence of Mr. J. C. Belton, the President of the Manchester District Institution of Gas Engineers, whom they were exceedingly pleased to see with them. The President proceeded to make sympathetic allusion to the deaths of Mr. William Cowley, of Spennymoor, Mr. Thomas Coates, of Darlington, and Mr. F. C. Sugden, of Leeds, members and associates.

The HON. SECRETARY (Mr. Herbert Lees, of Hexham) read letters of apology for non-attendance from Sir Corbet Woodall (President of the Institution of Gas Engineers), Mr. Doig Gibb, and several Presidents and Secretaries of District Associations.

THE ACCOUNTS.

The PRESIDENT moved the adoption of the statement of accounts, and remarked that, although there was a balance of £5 6s. on the wrong side, this was covered by other moneys, which left them about £12 to the good.

Mr. A. B. WALKER (Wallsend-on-Tyne) seconded the motion, and it was agreed to.

NEW MEMBERS AND ASSOCIATES.

The HON. SECRETARY announced the election of the following candidates:—

Members.—Mr. Harold Edgar Bloor, of Carlisle; Mr. Thomas Henry Beaumont, of Annfield Plain; and Mr. John Wilfred Dunn, of Stockton-on-Tees.

Associates.—Mr. Joseph Hubert Mitchinson, of Haydon Bridge; and Mr. William Bacon Richards, of Whitley Bay.

PAPERS AND DISCUSSIONS.

Mr. R. NELSON (East Hull) read a supplementary communication on the paper he submitted to the Association twelve months ago, entitled "Extensions to Carbonizing Plant at East Hull, with Notes on Working Results." [See "JOURNAL," Vol. CXVIII., p. 362.] The author's second communication, with the discussion to which the subject gave rise, will be found on p. 404. Mr. A. B. Walker (Walker and Wallsend) followed with a paper on "Results of Concentration of Works." This, with a report of the discussion, will be found on pp. 394-5.

VOTES OF THANKS.

Mr. TARRATT proposed a vote of thanks to the authors of the papers.

Mr. NORMAN S. COX (Sunderland) seconded; and the motion was very cordially agreed to.

REVISION OF THE RULES.

The HON. SECRETARY read the Committee's draft of the revised rules of the Association; and, after some discussion, they were adopted subject to verbal alterations to be made by the Committee. It was pointed out that one rule provided for the creation of honorary members; and this it was thought was very advisable, as it enabled them to confer honour upon distinguished persons in the gas industry.

ELECTION OF OFFICE BEARERS.

The election of officers for the ensuing year was announced as follows:—

President.—Mr. E. F. Hooper, of Sunderland.

Vice-President.—Mr. Thomas Waddom, of Newcastle.

Auditor.—Mr. W. Garbutt, of Newcastle.

Hon. Secretary.—Mr. Herbert Lees, of Hexham.

Members of Committee.—Mr. R. Nelson, of East Hull, and Mr. M. Fligg, of Redcar.

Mr. HOOPER thanked the members for having elected him President, and expressed his appreciation of the high honour conferred upon him. He mentioned that the next place of meeting was left in the hands of the Committee.

THANKS TO PRESIDENT, HON. SECRETARY, AND COMMITTEE.

Mr. J. WHYTE (Seaham Harbour) moved a vote of thanks to the President, the Hon. Secretary, and the Committee for their services in the past twelve months.

Mr. FLIGG seconded the proposal, and it was carried with acclamation.

The PRESIDENT quite briefly replied, and the meeting then terminated.

THE LUNCHEON.

A luncheon was held at the County Hotel, Newcastle—the PRESIDENT being in the chair. There was a large attendance.

After the loyal toast,

Mr. JAMES STEWART proposed the toast of "The North of England Gas Managers' Association."

The PRESIDENT replied.

The HON. SECRETARY proposed "Kindred Associations," and remarked that eleven years had elapsed since he had had the honour of proposing the toast. In a humorous speech, he said he had pleasure in doing so because he had to couple with the toast the name of the President, Mr. J. C. Belton, of the Manchester District Institution of Gas Engineers—an Institution which was second only to the North of England Association. [Laughter.] They had no Junior Association in the North of England; but when they looked round the table they saw what a large proportion of young men there were. It was seventeen years since he retired from the chair, and he hoped they would long have the young-old men to stimulate and encourage them. The tendency of the times was to bring all the branches of the industry together; and he was pleased to mention that Sir Corbet Woodall was President of the three principal gas organizations, all of which were more or less interested in the North of England Association. The speaker went on to allude to the several organizations, and remarked that there was much work for the District Associations to do. They in the North of England, in their Special Purposes Section, discussed not only commercial subjects, but everything relating to gas.

Mr. BELTON replied. He said he liked the word "kindred," because it gave one the idea of family ties; and he liked to think of family ties in their industry, not only in the District Associations and the parent Institution, which was happily united a few years ago, but of the three powerful Associations with the same interests, actuated by the same ambitions as were the Gas Managers' Associations. It was a great pity they were not a more united family. They had unity, though they were so many distinct houses, with one ambition and one purpose; but if they could be united in one establishment they would realize their strength. This would come not only from unity of purpose, but from union of association and action. They wanted to present a stronger front to their competitors. They would never do it as individual associations. The existence of their Commercial Sections, and the magnificent work done by the Junior Associations, was very satisfactory; and the virility of the older Associations was most gratifying. But a great deal remained to be done, which could not be done by the separate bodies. They must unite. As gas men, he did not think they made enough of the question of education. In this matter the District Associations could do very little. If the several Associations combined—each section of their work could be carried on distinctly—he believed they could do more to promote the interests of their industry by having it recognized, as it ought to be, in the *curricula* of their day schools.

Mr. E. F. HOOPER (Sunderland), the new President, proposed the toast of "The Press;" to which Mr. WALTER KING responded.

"Bulletin" of the Belgian Gas Association.

The "Bulletin" of the Belgian Gas Association for the past month is of a particularly interesting character. It is unusually large—the contents occupying rather more than 400 pages; and its special feature is an account of the functions connected with the Antwerp Exhibition (the speeches being given in English, French, and German), with illustrations of some of the stands, of the garden and the kiosk at night, and of the array of high-pressure lamps of 500, 1000, and 1500 candles supplied by the firms of Graetzin, Mannesmann, and Blanck which produced so striking an effect. A very good indication of the contents of the exhibition is given by M. Steinkühler in a *causerie* bearing the title of "Une Promenade à l'Exposition;" and the discourse by M. De Vigne on "Gas and its Applications from the Economic and Hygienic Points of View" is just of the popular "Lewesian" character suited to the occasion. The report is a permanent record of an event which will stand out conspicuously in the history of the gas industry on the Continent, and live in the memories of those who took part in it. The technical matter in the number comprises a paper on "High-Pressure Gas and Air for Obtaining High Temperatures and Light-Centres of Great Intensity," by M. Busine, with a note upon it by M. Casaubon; a description by M. Bauduin, of Maestricht, of his distance pressure indicator; an excellent summary, by M. Vander Willigen, the Continental representative of Messrs. Humphreys and Glasgow, Limited, of the report of the Sub-Committee on Calorimetry of the American Gas Institute; and a translation of Dr. K. Bunte's paper on the "Effect of the Character and Composition of Gas on its Use," submitted to the German Gas and Water Association last year, an abstract translation of which was given in the "JOURNAL" for the 2nd of July. This number of the "Bulletin," the price of which is 5 frs., bears evidence of the activity of the Association, to which reference was made by Heer Bolsius at the international gathering of gas engineers at the exhibition on the 5th of March.

RESULTS OF CONCENTRATION OF WORKS.

By A. B. WALKER, of Walker and Wallsend.

[A Paper read before the North of England Gas Managers' Association.]

IN a paper the author read before the Association in 1902, a table was included showing the percentage of gas used by the various classes of consumers from 1895 to 1901. The following table is a continuation, giving similar particulars from 1901 to 1912.

Consumer.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
Public works—												
Gas-engines . .	19·2	20·6	21·7	26·3	24·9	23·4	23·5	18·8	18·6	18·8	17·6	16·0
Lighting . . .	35·3	36·8	34·1	27·9	23·5	19·6	18·1	18·2	17·3	16·8	16·4	17·0
Ordinary consumers	30·5	26·1	25·6	21·1	20·8	21·3	21·5	22·8	23·1	23·4	23·3	22·4
Automatic ,,	5·7	7·9	11·6	18·2	23·8	29·0	30·2	32·6	32·5	33·2	34·8	37·4
Public lighting . .	9·3	8·6	7·0	6·5	7·0	6·7	6·7	7·6	8·5	7·8	7·9	7·2

The table shows a gradual alteration in the nature of the consumption and the times during which gas was being used. In 1901, 54·5 per cent. was the load due to public works, and between the hours of 6 a.m. and 5 p.m.; while ordinary and automatic consumers were responsible for 36·2 per cent. The advance of electricity was causing some reduction in public works consumption, which is most noticeable in 1905 and subsequent years. The 54·5 per cent. in 1901 is reduced to 48·4 per cent. in 1905, to 41·6 per cent. in 1907, and to 33·0 per cent. in 1912; while ordinaries and automatics increased from 36·2 per cent. to 44·6 per cent., 51·7 per cent., and 59·8 per cent. respectively in the years above-mentioned. The transition gave warning that not only further storage capacity must of necessity be considered, but additional coal storage and maufacturing plant must be erected, as the output of gas was steadily increasing. The only site available adjoining one of the then existing works was leasehold; and as the proprietor declined to lease for more than a period of thirty years, and the House of Lords refused to give powers for completing a compulsory purchase of the freehold, it was decided to procure a freehold site and concentrate the whole of the manufacturing plant on it.

A decaying Tyneside industry (cement making) was responsible for the local market for coke dwindling away, and with the limited storage—500 tons maximum and a yearly sale of about 14,000 tons—this valuable fuel, without shipping facilities, looked likely to become a drug. Further coke storage was, therefore, most imperative; and as inwards or outwards material by rail required carting, railway communication had to be secured if possible.

The Directors of the Company, therefore, acquired parliamentary powers for new works, &c., in 1905, and in November of the same year, to render the supply to consumers as regular as possible, the erection of a gasholder was begun. This was completed in 1906. The development of the site and the erection of the works were started in July, 1906, and the manufacture of gas was begun in June, 1908.

It may be well, at this point, to give briefly the principal advantages to be gained from the new works as these presented themselves in 1905, when the consumption of gas was increasing and seemed likely to steadily increase.

A.—A site capable of systematic development, as against sites commercially impossible of further development.
B.—The safeguarding of the gas supply in times of industrial unrest by larger coal storage.
C.—The saving due to the use of machines in manufacture, as against hand labour.
D.—The option of using oxide as a purification medium, as against lime purification rendered necessary by want of space for sufficiently large purifiers and revivifying floor.
E.—The reduction of staff.
F.—The ability to stock coke in case of a fall in price or want of demand, as against having to sell coke at very reduced figures when the stock reached 500 tons.
G.—The facilities due to railway connection in dealing with coals, coke, tar, sulphate, oxide of iron, &c.

These advantages may be further enlarged upon and more fully explained:

(A) To those who have had to deal with congested sites and plant, and even to those not so affected, the advantage of having a site where extensions could be carried out without scrapping existing buildings and apparatus must be evident, especially when the plant is in many details below its requirements, and radical alterations are necessary.

(B) At the old works the space available for storing coals was small; the stock at times of maximum demand not exceeding seven days. Few will deny that there was a necessity for increased storage, though some may not admit the advantage of larger stores. Previous to last year those taking up the latter position might have been able to make a fair case; but with the experience of the coal miners' strike, it seems incredible that any one should support such a policy. One dreads to picture the position under old conditions in March and April of last year, although it affords proof positive of the advantages due to ample coal storage.

(C) Up to a certain point and under certain circumstances, it is generally admitted that machine work does not pay. The old works, although one of them was close on that point, came under the head of being too small for power plant. Under such conditions, the locating of all the carbonizing plant on one site was justifiable from the saving to be expected in carbonizing results. It should be stated that at each of the old works 75 per cent. of the carbonizing plant was heated by regenerative, and 25 per cent. by direct-fired furnaces—the latter being used only at peak of load. All the retorts were single-ended, 22 in. by 16 in. by 9 ft.—eight in each oven. West's manual machine was in use on the regenerative ovens at Willington Quay; while scoop and shovel were used on the rest of the plant. While the manual machine was a decided improvement on the other methods, still, periodically, the operators, though not all, discovered weaknesses in the appliances, with the result of a falling-away in production, and this generally at the time of pressing need. Further experience seems to prove that power machines are not thus affected to so great an extent.

At the Howdon Lane works the retorts are set in ovens of eight through retorts, 22 in. by 16 in. by 20 ft. long. One producer heats each oven. As the quality of gas supplied up to 1903 was 16 candles, and gradually reduced to 14 in 1905, the results of 1906 are taken for comparison with 1912. Let it be noted, too, that first-class coals were used in 1906 with six-hour charges, as against eight and twelve hour charges and second-class coals in 1912.

CARBONIZING RESULTS.

		1906.		1912.
Coal carbonized	Tons	25,722	..	23,711
Gas sold	Cub. Ft.	267,740,000	..	269,149,000
Do. per ton of coal . . .	,,	10,409	..	11,351
Gas used on works . . .	,,	3,728,000	..	6,056,000
Gas accounted for . . .	,,	271,468,000	..	275,205 000
Do. per ton of coal . . .	,,	10,544	..	11,606
Coke and breeze saleable .	Tons	13,908	..	13,909
Do. per ton of coal . . .	Cwt.	10 60	..	11·73
Tar made	Galls.	273,111	..	219,544
Do. per ton of coal . . .	,,	10·75	..	9·26
Sulphate made, and liquor as sulphate on difference of stocks	Tons	191	..	217
Do. per ton of coal . . .	Lbs.	16·62	..	20·50

(D) Concentration afforded the opportunity of adopting oxide of iron as a purifying medium, against lime (as already mentioned) on the old works in purifiers that were very much overtaxed, and with no space available for revivification of the oxide. As regards nuisance to the surrounding neighbourhood, the advantage in the removal of oxide containing on an average about 2·5 per cent. of sulphides from two boxes each year is self-evident, while it will also appeal to those afflicted with the changing of two and three and sometimes four lime purifiers per week, as was the case at the old works. The cartage of waste lime through the streets was a source of constant complaint by the authorities.

Mention may be made here as to the sulphur compounds. Naturally, a very considerable rise in these was anticipated, especially as with lime purification bisulphide of carbon seldom rose above 10 grains per 100 cubic feet. In 1906, the Company were one of the promoters of the Sulphur Clauses Removal Bill, which, after opposition by the Municipal Authority in part of the Company's area of supply, was passed the same year. Though freed from restrictions as to quantity, it was deemed prudent to make provision for keeping the carbon disulphide within reasonable limits. For this purpose, two catch-boxes for lime, arranged to be worked separately or in series, were installed. The results were gratifying, and the lime got the credit, until investigations proved that there was no more carbon disulphide at the inlet of the lime purifier than there was at the outlet. A regular series of tests confirmed the finding in the first instance. A further analysis of the lime in the catch-box showed the lime to contain 95 per cent. of calcium carbonate—a medium quite useless for the removal of carbon disulphide. One of the lime purifiers was therefore emptied and filled with oxide; and during the past two years (the time the last-mentioned conditions have obtained), the average monthly tests have been as recorded in the following table. During the same period, the daily tests on thirty-two occasions

only, gave the carbon disulphide above 20 grains per 100 cubic feet; the maximum over all being 24·6 grains.

Year 1911.

Month.	Grains per 100 Cub. Ft.	Month.	Grains per 100 Cub. Ft.	Month.	Grains per 100 Cub. Ft.
April	18·45	July	17·58	October	21·70
May	19·23	August	18·45	November	19·45
June	19·78	September	21·70	December	18·13

Year 1912.

Month.	Grains per 100 Cub. Ft.	Month.	Grains per 100 Cub. Ft.	Month.	Grains per 100 Cub. Ft.
January	19·00	May	16·32	September	19·23
February	15·00	June	15·55	October	20·60
March	20·27	July	19·51	November	19·41
April	22·53	August	19·23	December	19·38

Year 1913.

Month.	Grains per 100 Cub. Ft.	Month.	Grains per 100 Cub. Ft.	Month.	Grains per 100 Cub. Ft.
January	16·32	February	18·85	March	17·36

(E) As anticipated, the superintendence and clerical staff are reduced to about half the previous number. Mechanics remain the same as before, although one blacksmith has been replaced by an electrician.

(F) Coke, when stored by hand on a restricted area, suffers through having to be thrown by stages to any great height. At the old works, at times, in later years when the cement trade was declining, this became a serious matter, not only on account of the breeze formed, but by reason of the cost of the trimming. Local requirements could only be supplied by cart, as cartage and labour costs of something like 1s. 9d. per ton rendered putting on rail unremunerative; while lack of accommodation afforded by the Railway Company made the supplying of even 100 tons on short notice almost an impossibility. A site on which a large quantity of coke could be stored to a moderate depth could, therefore, not fail to be an advantage; while this, together with railway accommodation, gave promise of increased revenue and fresh markets for this bye-product. As evidence of this, 1000 tons of coke were loaded and sent alongside for shipment on 36 hours' notice.

(G) As already indicated, all the outgoing products had to be carted to the railway station. Tar was filled into tar carts at the works, and from these run into tank waggons on rail. The reduction of cost and the abolition of nuisance in carting through the streets, must prove advantageous to the Company and to the neighbourhood. To the tar contractor, the delay in dispatching tanks was a serious matter, as, owing to limited accommodation at the station, it was quite a common occurrence for the tanks to stand waiting a turn in the loading dock for three days. Now tanks delivered during the morning are dispatched the same afternoon. To the tar contractor the new site has been an advantage, although as yet he has not given any tangible proof of it.

Having thus explained the likely advantages to be obtained by the concentration of the work (necessities are not mentioned), it is now but proper that the members should have facts to enable them to judge whether the manufacturing advantages are worth the cost. The annexed tables of comparisons are between the years 1906 and 1912. The year 1906 is taken because under old conditions this was one of the best years, and represented in gas sold practically the same as 1912; while 1912 is dealt with because it is the most recent available.

	1906.	1912.	Saving.		
Coal carbonized, tons	25,722	23,711	2,011	at 12/1·069	£1215 11 1
Gas sold . . cub. ft.	267,700,000	269,100,000	1,400,000	at 2/2·69	155 13 10
Purification	£882 14 4	£338 0 7			544 13 9
Wages	£3701 0 7	£1828 8 5			1872 12 2
Coke . . . . tons	13,908	13,909	1 ton		14 6
Sulphate of ammonia made and liquor as sulphate on difference in stocks, tons	191	217	26 tons	at 10/17/6	282 15 0
					£4072 0 4
Less loss due to reduction in production of tar . . . gallons	273,111	219,549	53,562	at 2¼d.	502 2 10
					£3569 17 6
In addition to this might be added at least one main saving—*i.e.*, in handling and delivery of residuals and materials. Exact figures here are difficult to obtain, but a very conservative estimate may be taken as					600 0 0
Making a total saving of					£4169 17 6

These savings are calculated on the net cost and realized prices of 1912. Any commercial variation in the values of the products would only slightly affect these figures. However, it may be noted that the saving as shown—£4169 17s. 6d.—capitalized at 4½ per cent. equals an expenditure of about £93,000.

DISCUSSION.

The PRESIDENT (Mr. C. H. Armstrong, of Walker) opened the discussion, and thanked Mr. Walker for complying with his request and giving facts and figures of his works. He said "his" works, as he designed them. He laid out the land, and carried through all the operations, without any outside help. His expenditure was below the estimates. He felt somewhat out of order in commenting upon his colleague's figures; but he might be permitted to say a few words upon what Mr. Walker's modesty had omitted. His final sentence in the paper indicated that the capital expenditure had been £93,000. This was a good deal over the aggregate expenditure on the works; and deducting the very expensive site—a site which, as purchased by the Directors, and looking forward, was supposed to be sufficient for the most sanguine expectations in the Company's scheduled area—and taking their 1912 figures of gas made, they found that the cost per million cubic feet of gas made worked out at £270. But Mr. Walker, in erecting his buildings, machinery, and apparatus, had provided for 50 per cent. above this output. So that if they took these figures which might have been, with the whole cost of the works excepting the site (but including the laying out of the site), it would total out at £180 per million cubic feet, which he thought was very satisfactory indeed. Mr. Walker also indicated a saving of over £4000. He might have added a lot of little items which would considerably augment his gross profit. He (the President) had worked out the gross profits for 1912, upon the same basis commercially and throughout the operations for 1906, and he found the gross profit had increased by considerably over £5000. So that not only did these works earn their own living, but they provided a good surplus in addition—a surplus of which the Directors last year took advantage and reduced the price of gas. The site could be developed fourfold.

Mr. A. C. HOVEY said that they were much indebted to Mr. Walker for having placed before them the principal features of his Company's great undertaking. It was decided upon at a time when the consumption of gas was not increasing so rapidly as was frequently the case in other places when large extensions were projected. He was faced with difficulties with regard to a site, and went to the extreme limits of his district. His works were within sight of another, and stood as a sentinel to warn off anybody encroaching in that direction. The fact that Mr. Walker had been able to economize to the extent that he and the President had mentioned, was excellent. Mr. Walker showed by his table that, for instance, in 1906 the gas sold for public works was 19 per cent., and in 1912 it was only 16 per cent. In other cases there had been a certain falling off; and it was an illustration of the vitality of the gas industry that he had been able to accomplish a reduction in the price of gas in the face of the keen competition with which he had had to contend. There operated in his district the undoubtedly premier provincial electrical company in the whole country; and Mr. Walker must have spent a great amount of time and thought in competing with such a concern, quite irrespective of the operations inside the walls of his works.

Mr. A. H. BAGSHAW (Sunderland) said he would like to ask Mr. Walker one or two questions with regard to the purification plant. The amount of sulphur compounds given in the paper appeared to be very remarkable, and he congratulated Mr. Walker on the results. What system of purification had Mr. Walker adopted? Was he using the backward or forward rotation system, and what amount of air did he use? He would also like to know, if possible, the air in the purifiers, in cubic feet. Was there a great reduction of carbon bisulphide in the purifiers? He would be glad to hear about the oxide used, and if there was a great reduction of carbon bisulphide. It was just possible Mr. Walker might have used a coal of low sulphur content; and it would be interesting to know the coal used at Walker and Wallsend. With regard to the purifying costs, he saw there were two boxes of oxide used, and possibly a check-box; and the purifying costs were given at £338 0s. 7d., which seemed rather high for this class of work. It came out at 0·29d. per 1000 cubic feet.

Mr. WALKER, in reply, said that the system of purifying they used was the backward one. The boxes were 30 feet square, and contained 3600 square feet in the four. They used "Hurdle" grids; the material being a mixture of "Lux" and Belgian oxide. As regarded air, they sometimes worked up to as high as 6 per cent. The sulphur at present was 600 grains per 100 cubic feet. It came down to 550 and 575. The kind of coal he used was therefore furnishing a good amount of work for the purifiers. In proof of the fact that he was not overdoing it, the free oxygen in the purified gas had not exceeded 0·3 per cent. during the past twelve months. So far as the question of sulphur and sulphur compounds in the purifiers was concerned, he had hoped to induce his chemist to read a paper on the whole subject of purification; but very unfortunately something had cropped up to prevent him doing so. There was not a great deal of difference between the sulphur at the inlet and the outlet of the purifiers; and following on the figures given by Mr. Nelson, he thought the use of eight-hour and twelve-hour charges, and having the horizontal retorts full, was the reason why they got such a low and regular quantity of CS_2 in the gas. He did not think the purifier had anything to do with it. With regard to purification costs, in last year's accounts there was an item of 100 tons of "Lux" and 100 tons of something else. They had not spent anything on oxide yet; and these, with some other costs, might be taken as coming down to something considerably under £100. He knew this might be considered a little too high; but they did not—especially when the Press were present—tell exactly what everything had cost them. [Laughter.] As regarded the arrangement of the purifiers, there were six purifiers altogether—worked by two sets of Weck valves; and they could be operated either in series or separately.

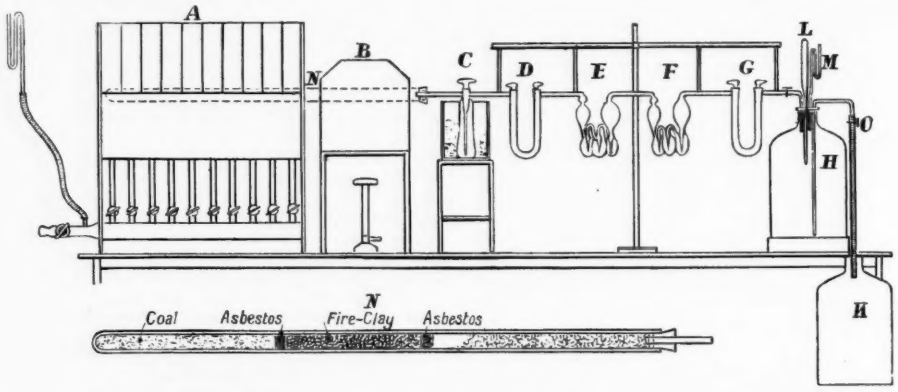
SIMPLIFIED METHOD OF DISTILLING COAL TO DETERMINE ITS OUTPUT OF GAS AND BYE-PRODUCTS.

An article on this subject by Herr Q. Schramm, of Aix-la-Chapelle, appeared in the "Journal für Gasbeleuchtung" for April 26. We give an abstract translation of the author's description of the process. The circumstances in which laboratory results are obtained, he remarks, naturally differ somewhat from retort-house conditions. But this method, which has been employed in Westphalia for some years, can be relied upon to give results agreeing very accurately with those obtained in actual carefully conducted working.

The point to be borne in mind is always to keep the working conditions unchanged. Then, when the chemist has had some practice with the system, and compared his results with actual working results of the same coal, he can take a new kind of coal and determine with accuracy what may be obtained from it on a large scale. The general principle is the distillation of the coal in a strong combustion tube in a suitable oven, and the collection of the resulting bye-products in succession. The tar is retained by previously weighed cotton-wool; and the gas liquor, and the ammonia it contains, by a flask containing dilute sulphuric acid, cooled by water, or better still ice. A tube containing a known weight of calcium chloride arrests any moisture. Carbon dioxide, sulphuretted hydrogen, and hydrocyanic acid are trapped in two special pieces of absorbing apparatus filled with 1:3 caustic potash solution, which are also connected with a weighed calcium chloride tube to arrest any moisture they might give off. The gain in weight of these three gives the total of the carbon dioxide, sulphuretted hydrogen, and hydrocyanic acid. Titration of part of the caustic potash solution with a N/10 iodine solution and a N/10 sodium thiosulphate solution gives the quantity of sulphuretted hydrogen and hydrocyanic acid. To determine the exact amount of the latter, some of the solution is distilled with saturated lead nitrate solution, and the hydrocyanic acid given off is collected in N/2 caustic potash and titrated with N/10 silver nitrate. Thus the separate quantities of each of these three gases is known. The purified gas passes finally into a large flask filled with water, fitted with thermometer and mercury manometer for the exact measurement of the gas. During the experiment the whole apparatus is kept under vacuum.

The Apparatus.

The apparatus is shown in the accompanying diagram. A is the heating oven, which is about 14 inches long, and is fitted with ten burners, and on each side ten fire-clay slabs. The inlet end of the main gas pipe is connected with a water manometer, so that the gas pressure can be watched and kept constant. One end of the distilling tube protrudes through a hole, slightly larger than itself, in a quartz slab forming one side of the oven. The protruding portion then passes through the steam bath B, which is provided with openings for its reception, in which it rests supported by cotton wool. The bath is heated from below by a burner. C shows the flask containing dilute sulphuric acid, standing in ice or water, as described above. The acid is best tinted with a little methyl orange, so as to avoid possible confusion with the other solutions. D is the calcium chloride tube, to catch any moisture escaping from C. E and F are the flasks of caustic potash for absorbing carbonic acid, &c., and G the calcium chloride tube for stopping loss of moisture from them. H is the flask in which the gas is collected, and should hold about 10 litres (0·35 cubic foot). The thermometer L and mercury manometer can also be seen. K is the flask into which flows the water displaced from H by the gas. The distilling tube is about 20 inches long and ½ inch in diameter, and is hermetically sealed at one end.



The Working.

First 15 grammes of well dried and powdered coal are weighed out and introduced carefully into the tube. Then a wad of previously ignited asbestos is pressed down lightly against the coal. Next a small quantity of grains of fire-clay are introduced, and kept in place by another asbestos wad. This fire-clay is intended to have the same effect as would the walls of the retorts or ovens, in breaking-up the ammonia, &c., formed. Then the tube is left empty for a short distance, and the rest packed loosely with cotton wool, previously dried and weighed. The filling of the tube can be seen in the diagram at N. As soon as the different parts of the apparatus have been connected up with rubber tubing, and the flask H completely filled with water, the pinch-cock O is opened. Under the influence of the vacuum, water will flow from H to K. After a time the flow will stop if the apparatus is air-tight throughout, which condition being fulfilled, the pinch-cock is closed, and only opened again if the gas evolved begins to cause any pressure at the manometer M. If there is no leak, the burner under the steam bath is lighted; then those directly under the fire-clay in the tube; next the burner under the asbestos plug nearest the coal is lighted; and so on. The slabs are only kept closed over those burners which are alight. Care must now be taken that the distillation proceeds regularly and quietly. Generally a period of some fifteen minutes should elapse between the igniting of two consecutive burners under the coal. The distillation is shown to be complete when gas bubbles only extremely slowly through the liquid. Then the temperature of the gas collected in H should be read, and also the vacuum in column of mercury and the barometer. Then the pinch-cocks are closed; the burner under the steam bath extinguished; and finally the main cock of the oven. The distilling tube is allowed to cool and is separated from C. The various absorption flasks are weighed, and the water that has been driven over into K is measured.

The Calculations.

From the increase of C + D can easily be calculated the percentage of gas liquor. The increase of E + F + G gives the production of $CO_2 + H_2S + HCN$. The tube should then be broken, by means of a file, between the ring of tar that has formed and the fire-clay; and the part filled with cotton wool and containing the tar is weighed. The contents of C are then carefully washed into a beaker, and the wool from the distilling tube also rinsed to remove any adherent particles of ammonia. The solution is then tested, by any of the usual methods, to determine the amount of ammonia in it. The piece of tube containing cotton wool and tar, which was broken off, is then washed out and re-weighed, and the quantity of tar calculated by subtraction (the weight of the wool being already known). The weight of the coke remaining is easily found. The contents of E and F are made up to 100 c.c. by the addition of water, and tested for the individual quantities of HCN, H_2S, and CO_2, if it is desired to know these. The amount of gas from a ton of the coal is given by the quantity of water displaced × 100 × 1000 ÷ 15. Corrections for vacuum and temperature are best shown by an example. Let:

Water displaced per ton	= 334 cubic metres.
Barometer reading	= 748 mm. Hg.
Temperature of gas	= 13° C. (= vapour tension 11 mm. Hg.).
Vacuum at end of distillation	= 50 mm. Hg.

Then the real pressure is 748 − (11 + 50) = 687 mm.
Therefore the volume of gas corrected to 760 mm. pressure and 0° C. would be:

$$\frac{334 \times 687}{760 \times \frac{273}{273 + 13}} \text{ cubic metres.}$$

On Saturday, the 26th ult., at the Kilmalcolm Hydro., the marriage was solemnized of Mr. Arthur Bromley, the Engineer of the Batley Corporation Gas-Works, and Miss Mary Weir Hamilton. A large number of guests were entertained by Mr. and Mrs. Thomas Duncan. Later in the day Mr. and Mrs. Bromley left for the South of England.

THE STREET LIGHTING SPECIFICATION.

Discussion Concluded on Mr. A. P. Trotter's Paper.

LAST Tuesday evening, there was again an interested audience, at the meeting of the Society of Illuminating Engineers—Mr. F. W. GOODENOUGH, the Chairman of the Council, presiding—when the discussion was resumed on Mr. A. P. TROTTER's paper on "Standard Clauses for Inclusion in a Specification of Street Lighting." The main parts of the paper, together with the draft specification, and the first part of the discussion were published in our issue for the 22nd ult. (pp. 250-259).

MR. GOODENOUGH'S VIEWS AS TO THE REQUIREMENTS OF A SPECIFICATION.

Mr. GOODENOUGH, in re-opening the discussion, said that the object of the discussion was to endeavour to arrive at a practical result; and he thought that those who wished to criticize the specification could most usefully do so early in the discussion rather than later, so that subsequent speakers could reply to, or discuss, any points raised. Being one of those who had to make criticisms, he thought it might be useful if he made them at once. He would ask those present to regard him, just at the moment, not as Chairman of the meeting, but simply as one interested in street lighting who desired to express his views on the specification. Mr. Goodenough then proceeded as follows: It seems to me that the requirements for a specification on which to invite tenders for street lighting are: First, it ought to be framed on a basis easily comprehensible by members of local authorities. Secondly, it should, if possible, have as a standard something with which "the man in the street" is familiar, and can understand. Thirdly, it should be of general, not limited, application. Fourthly, it should be so framed that it is not open to being interpreted in such a way that the lighting of a street is reduced to an absurdity, while the specification is strictly complied with. Fifthly, it should leave nothing to the discretion of the contractor—*i.e.*, when tenders are opened, they should be in every respect on identical bases, so that the respective prices could be tabulated, and directly compared. There should be no qualifying or descriptive clauses which would leave to members of the committee or council dealing with the matter the decision of whether the scheme set out in tender "A" or that in tender "B" would prove the more satisfactory scheme for the lighting of the streets in question. Otherwise, the whole object of adopting a "standard" specification would be defeated; and we should get back to the old unsatisfactory position of having the comparative merits or demerits of two schemes of lighting discussed and adjudicated upon by a body of men having no knowledge that would qualify them for forming a sound opinion upon the subject, and of having the canvassing powers and local influence of the competing tenderers brought into action. Sixthly, the provisions for making the tests to which the illumination provided by the contractor is to be subject, and upon which he is to be liable to penalty for deficiency, should be such as to secure, as far as possible, precision of result. The margin for possible error should be small. The method of testing should be as closely defined as possible.

In my opinion, the draft specification under consideration fails to comply with any one of these requirements.

As to the first point—that of ease of comprehension—not one councillor in a thousand knows, or could be made to understand intelligently and thoroughly, what would be meant by saying that the streets in his district were going to be so lighted that there would be a minimum illumination of 0·025 foot-candle on a horizontal plane at a height of 3 ft. 3¾ in. above the ground level. Scientific formulæ and nomenclature are very pleasing and satisfying to the scientific mind. They are liable to be highly confusing and mystifying to the lay mind, and should never be employed when the same result can be achieved by the use of simpler language. The value of the Illuminating Engineering Society to the world of business will be in direct ratio to the scientific accuracy of the principles it enunciates in regard to questions of illumination, but in inverse ratio to the scientific jargon in which it expounds these principles. To be appreciated, we must be understood. If then we can get a basis that can be comprehended by the average committeeman—I do not ask for the impossible, and say "by *every* committeeman"—we shall have provided something much more practically useful than this specification gives us.

In regard to the second point—that of the desirability of a familiar standard—it is obvious that, if we wish to get a basis of specification comprehensible by the man who wants light in the street, we should be wise to adopt a standard with which he is familiar. Everyone is familiar with the expression "a lamp of such-and-such candle power." A thousand people—even members of a lighting committee—would have some fairly accurate conception of the difference between a 16-candle power lamp and a 1000-candle power lamp, to one person who would have any conception whatever of a street with "a minimum horizontal illumination of 0·025 foot-candle."

Is there, then, any really good reason why we should not adopt lamps of specific candle power as the basis of a street-lighting specification; and so comply not only with the second, but also with the third, requirement that I have laid down—that the specification shall be of universal, not limited, application? It is surely only a question of (*a*) specifying what is meant, for the purposes of the contract, by candle power (this is already contemplated by the specification, and would, Mr. Trotter admits, have to be adopted in respect of 80—I should say 90—per cent. of the streets and roads throughout the country); and (*b*) determining how many lamps of specific candle power on columns of (or suspended at) a specific height, placed at specific distances apart, are required to give illumination of desired grades—Class "A," Class "B," and so on. That is the sort of proposition that a council or committee can understand. Their expert advisers may comprehend tests of minimum horizontal illumination defined in foot-candles; but the value of such observations has, it seems to me, been considerably over-rated. It lies chiefly in providing a means for expressing in precise figures, and checking, the observations of the eye as to the comparative degree of illumination—first, second, or third class—found in streets already lighted. We must, if we are going to be practical, work in these matters of illumination by analysis before synthesis. We must take existing examples of lighting, see if they are good, bad, or indifferent, and then analyze the causes of the effects; and we only need these horizontal minimum illumination readings, in conjunction with maximum and average illumination readings, to enable us to express the effects, and to verify our "rule of eye" classifications.

If there had never been any street lighting at all, and we had started to plan out on paper scientific illumination for the streets by calculated minimum horizontal illumination, who would have believed that most excellent and satisfactory lighting results could be obtained by a scheme which provided for a minimum horizontal illumination only $\frac{1}{20}$th of the maximum horizontal illumination? Yet we know by experience that a variation factor of 25 or 30 to 1 is compatible with thoroughly satisfactory illumination in the streets—illumination which to the eye appears uniform, because of the imperceptible degrees of gradation.

A great deal is made by the advocates of the draft specification of the point that local authorities are out to buy "not lamps, not candle-power, but illumination." But this is surely only using words to confuse ideas. It is true that local authorities want to secure effect; but it is equally true that to obtain effect you must purchase the necessary cause. When you feel hungry you are "out to buy" satisfaction of your hunger; but you do not go into a restaurant and order "minimum horizontal satisfaction." (Laughter.) You know by experience what dishes go to make up a first, second, or third class dinner; and, according to the state of your purse or your views upon Simple Life, you order the courses necessary to produce the desired effect. The inexperienced diner possibly produces "glare" in the eye as the result of his efforts; the experienced secures a satisfactory "diffusion." [Laughter.] If a medical man is called in to the former, he will doubtless prescribe a standard specification of diet; but it will be in terms of food, and not of "minimum dietetic satisfaction, expressed in decimals of pulse-temperature." [Renewed laughter.]

The local authority wants illumination as an effect. To obtain the effect, lamps of certain candle power, at certain heights and distances apart, are needed. Why not say so? If you do not, you fail to comply with the fourth and fifth requirements I have outlined. You leave yourself open to the possibility of very small units of light being placed on very high columns wide apart, which would give the same minimum horizontal illumination as lamps of greater candle power on lower columns at the same distance apart, or as lamps of the same candle power on lower columns nearer together! Taking Mr. Haydn Harrison's table, we find that a specification calling for 0·01 foot-candle minimum illumination on a horizontal plane, 3 ft. 3¾ in. above the ground, in a street 2100 feet in length, would be complied with by the provision of—

(*a*) 21 33-c.p. lamps on columns 36 feet high; or
(*b*) 21 95-c.p. " " " 10 " " ; or
(*c*) 30 34-c.p. " " " 10 " "

Who is going to say that the street would be equally well or equally satisfactorily lighted under all of these different arrangements? Yet each of them is rendered possible by the draft specification, because it ignores maximum illumination, ignores average illumination, ignores gradation of illumination, and only takes into account minimum illumination. Mr. Trotter says that "if the illumination is up to a certain specified standard, it does not concern the public whether it is produced by a few lamps of large candle power or by more lamps of less candle-power, or whether tall or shorter posts are used, within certain limits." I should like to repeat that quotation to Mr. Trotter on a foggy night in a street lit by lamps on high columns 100 yards apart! Mr. Kenelm Edgcumbe—as, he tells us, a more than ever convinced "whole-hogger" for the specification—will, no doubt, say that a dismally lighted street is as desirable and admirable as a brightly lighted

street, so long as it has the same minimum horizontal illumination. But I should just like to quote in this connection something which he wrote six years ago, in a paper on "The Comparison of Street Illuminants." He then said:

> Although to compare the minimum illumination may be a highly scientific way of treating the problem, at the same time street illumination has its æsthetic side, which is by no means less important than its scientific; and since it is the man in the street who pays the bill, his views have to be consulted. When asked which of two streets he considers to be the best lit, he will inevitably declare in favour of the one which has, not the highest minimum but the highest average illumination. It may not be logical, but the fact remains.

Personally, I do not see the failure in logic. Mr. Edgcumbe then proceeded:

> This point is well illustrated by a comparison, for example, of Oxford Street and Kingsway [he was speaking of the lighting that existed at that time] in which the minimum illuminations are much the same; but there can be no two opinions as to which street is the best lit. . . . Although an even illumination equivalent to the minimum permissible is no doubt scientifically what should be aimed at, on the other hand a street with a high average illumination, even though less evenly distributed, gives a much more pleasing impression—in fact, there is probably much the same difference as between what would be called a "bright" day and a "dull" day.

I commend these very practical and sound observations to the careful consideration of the municipal and county surveyors who represent the interests of "the man in the street" (including the tradesman, who wants his thoroughfare to be bright not dull), and who would not appreciate being made a laughing-stock for the ratepayers by adopting a specification that, with its ultra-scientific eye, regards a street of dismal appearance as being equal to one of a bright and pleasing appearance; though I beg leave here to protest against the abuse of the word involved in calling such ideas "scientific" in any way. Science is organized knowledge, and the science that leaves out of account obvious facts and considerations has no right to the title. Here I am glad to be able to quote from a communication that the Society has received from Dr. L. Bloch, of Berlin, who, in the course of some very interesting criticisms of the draft specification, gives it as his opinion that

> The prescription of a certain minimum illumination alone is not sufficient to ensure a well-lighted street. The adoption of this prescription of minimum illumination would also exert a marked influence on the arrangement of a street-lighting installation, and by no means a favourable influence. It would encourage the already prevalent, but injudicious, method of placing lamps in the streets as high as possible; for it is common knowledge that, by placing the lamps high, one can in general get the best value of the minimum illumination, and the uniformity is also improved. But it is possible under these circumstances that there will be no single point in the street where the illumination is strong enough to read with ease.

I also find very strong support in the communicated views of Dr. Louis Bell, the well-known American authority on illumination. He says:

> There is no objection, if anybody fancies the idea, to putting in a minimum illumination clause, provided nothing of any importance is made to hinge upon it, in which case it might as well be forgotten. The inevitable effect of a minimum illumination, which the contractor may furnish substantially according to his own plans, will be found to be the smallest total light flux which can be made to serve. A call for minimum illumination is practically a call for small gas or electric incandescents glimmering along the street at intervals as infrequent as can meet the specification for illumination midway between them. These are not matters of theory, but conditions which will inevitably confront the municipality in undertaking its street lighting. It is my judgment, therefore, that an illumination specification can only prove useful when it has very little to do with the real considerations of the contract. I have always looked upon a contract for street lighting as essentially a contract for service, under specified conditions, with certain specified illuminants, of which the performance can be both definitely ascertained in the laboratory and easily checked on the street. It is the task of the engineer having the work in charge for the municipality to see what luminous sources, and what arrangement of them, will give him the illumination required in streets of various classes, and then to insist on the use of these illuminants under certain standard conditions which can be maintained. I have found in practice that specifications drawn on this basis produce good results, with extremely little friction between the contracting parties.

The fifth requirement laid down for an ideal specification, that it should leave nothing to the contractor other than the choice of the lamp of specified candle power, needs little to be said to commend it to all practical men who have had experience of submitting street-lighting schemes to local authorities. For a standard specification to serve the important end of providing a local authority with a basis for the invitation of tenders, it is absolutely essential that it should leave nothing vital to the discretion of the contractor or the choice of the authority after the tenders have been opened. All questions involving choice—questions of height and design of column and so forth—must be decided beforehand, and the result be embodied in the invitation to tender. I believe that every surveyor will agree with me on this point; and I consider that the failure of the draft specification to provide for this essential is absolutely fatal to its acceptance as a model.

Finally, the provisions under which the testing shall be carried out so as to determine whether the contractor is fulfilling his obligations must leave as little room as possible for error, dispute, and injustice. It is generally admitted that anything approaching absolute accuracy in reading small minimum horizontal illuminations is impossible. Even in the case of fairly high values, we find variations of 7 per cent. as between readings by the same expert photometrist, Professor Morris; and no one closely acquainted with street-lighting photometry would be willing to accept a margin of less than 25 per cent. to provide against errors of observation and local disturbing influences in taking low minimum illumination readings. It will be said: "Take your readings direct from the various lamps contributing to the minimum illumination, and calculate your minimum illumination from them. But this method introduces, as the Committee have seen, a possibility of over 20 per cent. difference, apart from errors of observation. Will surveyors or councils allow a margin of, say, 33 per cent. from the contract minimum, or are contractors to be obliged to provide this excess so as to guard against possible penalties? And is a specification that necessitates the one or the other of these alternatives a scientific or a practical proposition to put before street-lighting authorities? Here, again, let me quote Dr. Louis Bell:

> If illumination is to be the real basis of a contract, penalties under the contract must depend upon a measured deficit in illumination; and practically all photometrists in this country who have had experience with illumination measurements on the street recognize that the degree of obtainable precision is not sufficient to justify making them the basis of large monetary settlements. In a street-lighting contract, involving £50,000 or £100,000 per year, a difference of 2 or 3 or 5 per cent. in the measured illumination is a very serious matter, and, dependence upon measurements which are known to vary within at least this range would simply lead to exasperating litigation. I have made a very large number of measurements on the street, first and last, in a considerable variety of instances, and know from personal experience the magnitude of the difficulty here referred to, and the utter hopelessness of getting an amicable agreement between the municipality and the contractor on any such uncertain basis.

I submit then that this draft specification fails in every essential point to meet the requirements of a standard specification for street lighting. That is, however, only destructive criticism. What practical alternative is there to offer? I am of opinion that if the Joint Committee would abandon the proposed "Unit of Measurement" clause, and substitute one providing for rated candle-power of the lamps determined by direct readings at specified angles, in a specified direction, with a specified relationship between readings at the widest and the narrowest angles, and would provide a schedule showing by what number and arrangement, height, spacing, and placing of lamps of specified candle power the illumination of streets in Classes "A" to "E," or "F" or "G," could be (because it has been) obtained, they would produce, and very quickly produce, a specification of real practical value with a truly scientific basis; and in this opinion I am again fortified by Dr. Bell, who considers that the draft specification would be improved "if more stress were laid upon the candle-power at a fixed angle from the lighting units to be furnished." The draft specification suffers, if I may say so without offence, from science run mad. It has the atmosphere of the laboratory and not of the street. And I ask the Joint Committee to come down to practical conditions and considerations, and leave so-called scientific specifications to those who find them all-sufficient. I only want to say in conclusion that the criticisms I have felt it my duty to make have been directed solely to the end of securing a satisfactory standard specification for street lighting. Such a specification is badly needed, and a practical, equitable, comprehensible, and comprehensive specification will be welcomed by all suppliers as well as users of illumination. But it would be worse than doing nothing to meet that requirement to put forward an impractical specification, applicable at best to only one case in ten, that would not hold water in even the one case, and that would leave the local authorities in the same condition of uncertainty, as to what they want and how to get it, as they are in at present.

A Correction.

Professor J. T. Morris (London), a member of the Joint Committee, said he thought it would assist matters if he tried to clear up certain references to measurements of his which had been called in question. Mr. Patchell very kindly referred to the tests that he had made as a member of the Street Lighting Committee. He felt it his duty to place before the Committee absolutely every measurement that he made. Certain discrepancies had been observed. He (Professor Morris) did not repeat his tests. He had not the time to do so. But in any ordinary work one would naturally repeat the tests. He had since collected the figures which were obtained, to see if there were any reasons for the discrepancies. Not a few speakers had referred to the fact that there was an error of something like 22 per cent. He himself had obtained an error of 22 per cent. between the calculated horizontal illumination as summed up from a number of lamps shining on the horizontal plane and the actual measured value on the same plane. He had arranged the tests in the order of the horizontal illumination; and if one arranged them in the order of descending illumination—if one started with a maximum average illumination of 0·03 foot-candle, he got an error of 3 per cent. Then with 0·023 foot-candle, he got exact coincidence. With a horizontal illumination of 0·021 there was an error of 7 per cent. And it was not until one got below 1-50th foot-candle that errors of 10 per cent. crept in. The 22 per cent. error was obtained with an illumination of 0·017 foot-candle. Taking the difference, instead of the percentage error, in the amount of illumination that one was out by, the figures came in this order: 100oth of a

foot-candle in the first case; less than that in the next case; 1½-100oths in the succeeding case; and it was not until one got to 0·017 foot-candle that one had 4-100oth. These figures showed that the lower the horizontal illumination which was to be measured, the greater might be the actual difference between the measured and the horizontal. So the percentage went up at a much greater rate. Personally, he should have been glad if these figures had not been put before the technical public, because they were just a straightforward statement of the actual observations made, without any check tests of them. And he thought it should be clearly understood that provided the measurements were not below 0·02 foot-candle, the maximum observed error was not more than 1½-100oths of a foot-candle. He believed with the improvements that were being made in photometers at the present time that these figures could be easily improved in the matter of accuracy. It should further be borne in mind that it was more than two years since the measurements were made. The Hon. Secretary had kindly sent him a number of criticisms from experts on the Continent and America; and frankly he must say that the experience of these well-known men seemed to go against taking the minimum horizontal illumination as the sole basis. Their opinions all appeared to go against it. Some agreed with it provided something else were taken as well. He did not know whether it was possible to arrange so that the minimum horizontal illumination was taken, *plus* either the average or the mean hemispherical candle power as given by the lamps. This was a mere suggestion. But in view of the opposition, he thought it was clear that (he was only speaking personally) some modification was required; and naturally they wanted to get to a satisfactory conclusion. Many present were familiar with the lighting of the Institution of Electrical Engineers; and they saw the lighting of the hall of the Royal Society of Arts in which they were then assembled. There was a kind of gloomy effect produced in the Institution of Electrical Engineers' rooms; and he believed the difficulty they had there was being found here in regard to the minimum horizontal illumination being taken as the test, because he took it that some speakers who were criticizing horizontal minimum illumination would say, if this was taken, and it was the same throughout a street, that it would produce a very depressing effect. Now he did not suppose the illumination of that room was better than it was at the Institution of Electrical Engineers, so far as reading was concerned, yet it produced a more cheerful effect than there, though the walls were darker than in the other case. So as some of their German friends seemed to indicate that uniform horizontal illumination was not to be aimed at as the sole basis, he thought that the suggested specification would require some modification.

The Westminster Candle-Power Standard.

Mr. J. W. Bradley, M.Inst.C.E., the City Engineer of Westminster, sent the following communication, which was read by Mr. Dow: Speaking as one who has for many years had the specification and control of public lighting installations, who has for twelve years conducted the execution of contracts for public lighting definitely based on a candle-power standard, and has also, with his assistants, carried out comparative tests of surface illumination values, the writer does not hesitate to express satisfaction with the working of candle-power standard contracts, and preference with this system over the surface illumination test. To give an intending contractor the candle-power he is required to supply and the height above the street at which it is to be fixed (stating, within limits, the polar distribution), reserving the right of approval of the general character of the lantern and its reflectors, supplies the contractor with a definite practical problem to solve; and he can deal with it with much less trouble than if he is to consider the many points involved by the adoption of a minimum illumination value over a large area. Consideration of these points, even if undertaken by him, would in many cases be largely wasted, because of the numerous questions which would crop up in connection with the actual position of lamp-standards and the different intensities of light required throughout varying depths of atmosphere in town streets of different importance in many respects. It is also essential that if there is a weak spot in a lighting installation, that weak spot should be localized and improved up to standard from time to time as weaknesses develop, rather than that the contractor should be told that a certain area is not properly illuminated, and he should then have to set out to discover and remedy the fault. If a contractor has to be penalized for failure to supply a specified amount of light, he ought to be told of the exact point at fault, so that he may remedy it immediately. Moreover, it would probably be difficult to penalize a contractor for insufficient lighting, because the minimum illumination had fallen below a specified figure, when the temporarily depreciated light might be caused by changing circumstances entirely outside his control—such as a change in the weather, the non-painting of a house front, the growth of trees, &c. Again, if a contract is fixed on a surface illumination basis, how is provision to be made for a change in the lighting unit? The writer cannot agree with Sir William Preece when he says "that it does not concern the public whether light is produced by a few lamps of large candle power or by more lamps of less candle power, or whether tall or shorter posts are used." It is certainly very desirable that as few lamp-posts as possible should be used, considering the obstruction they cause to the public; and it is also desirable in important streets that all lamps giving a proper illumination throughout a sufficient depth (vertical height) above the street surface should be adopted. It is wrong to presume that the positions of the points of light and their number can be omitted with advantage from a contract. The approximate number ought to be definitely stated, and a price given in the tender per position for each class of lamp; the positions in which they are placed must be a matter entirely in the hands of the municipal engineer as representing the local authority. There are so many things to be taken into account which a contractor forming his tender on an illuminated surface basis could not anticipate and allow for, and which prevent the equal distribution of light over the illuminated surface and through the illuminated depth which is so desirable, but impossible to obtain under working conditions, and which those who advise the adoption of illuminated surface as a standard have not and cannot provide for. The position of vaults, cellars, areas, and forecourts, the presence or absence of gas, water, electric, telephone, telegraph, hydraulic, and other mains, cables, and services in the street or footway, have a large bearing on the position in which a lamp shall be placed. The angles and junctions of streets, recesses, and projections of buildings; the distance of the building line from the street line; the character of the dwellings and of the rooms adjacent to the proposed lamp position, and the use to which the rooms may be put near a lamp position—have all to be considered. The trade carried on in a shop adjoining may also frequently be influenced by the presence of a lamp; and to suggest that it should be left entirely to the contractor to put his lamps where he will, so long as he illuminates to a satisfactory degree a plane at a height of 3 ft. 3 in. above the street level, is unreasonable, and would lead to endless disputes between ratepayers and the local authority, and the contractor and the local authority. This matter cannot be looked at from a laboratory standpoint, but must be considered in the light of the hundred-and-one practical points which arise in actual working, and with due consideration to the class and amount of traffic, pedestrian and vehicular, on roads varying in character from the village highway to the metropolitan street. The writer believes that he was the first to specify in a lighting contract a definite amount of measured light as a basis for tendering; and after many years' experience of public street illumination, carried out under contracts having for their basis of agreement the measurement of direct candle power, and with the knowledge of the working of such contracts in respect of both gas and electricity, intensified, filament, and arc lighting, he can definitely state that these contracts have proved satisfactory in every way; further, they have lapsed and been again re-entered upon by the previous contracting parties—a fact which in itself testifies to their fairness and ease of working. The principal points of this specification are indicated in the following extracts:—

The contractor shall pay to the local authority as liquidated damages the sum of 5s. per day or portion thereof for every lamp giving at the time of testing less than the specified candle power provided for in the annexed specification, each day commencing at twelve o'clock midnight. Tests may be made at any time during the specified lighting hours.

In the case of "large units," the lamps are to be erected on suitable and approved columns of such a height that the centre of light shall not be less than 22 feet above the adjacent surface of the ground. In the case of "small units," the centre of light shall be not less than 12 feet from the adjacent ground surface.

The design of lamp-pillars is subject to the approval of the council, and such pillars must be of cast iron or cast iron and steel tube construction. In the case of electric lamps, provision must be made for the winding gear to the footway columns. Arc lamps shall be fitted with automatic substitutional resistances, so that the failure of one lamp will not interfere with others in the same group.

Each lamp is to be fitted with burners, mantles, globes, and fittings, as the case may be, giving a minimum of 90, 180, 1800, or 3000 standard candle power respectively, as directly measured by an approved portable photometric apparatus placed at ground-level, and is to burn 3940 hours per annum in accordance with a daily schedule to be hereafter supplied by the local authority. The fittings and lamp must be in every respect to the approval of the City Engineer, and in particular the reflectors above the light are not to be concave to the light so as to concentrate the illumination at the foot of the lamps, but horizontally flat or slightly convex, as approved by the City Engineer, so as to disperse the rays. The tests will be taken in such a manner as to ensure that glazing bars shall not interfere with the results obtained. The candle power shall be arrived at by taking the average of two readings in any position with regard to the light under test, one reading at an angle of 20°, and a second reading at an angle of 50° to the horizontal. A test standard unit of 1 foot-candle or of any size in excess of this up to 10 foot-candles may be used, according to the character of the photometer with which the tests are made and the class of lamp being tested, all as the City Engineer may approve. The photometer shall be of a type approved by the City Engineer. The intention of this contract is that the contractor shall assure himself by continued test and inspection that the lamps he provides are during lighting hours fulfilling in all respects the requirements of this contract; and he shall not claim relief from the conditions of this contract on the grounds of non-notification on the part of the local authority of any failure to comply with the terms of this specification. The light given shall be of a steady, invariable character, of a white or yellowish-white colour.

Mr. John Darch observed that he did not think Mr. Bradley could really mean that when one suggested minimum illumination, the position of the lamps should not be mentioned. Surely the specification should mention the position of the lamps, and every point necessary to ascertain that the strength of the lamps was enough to produce a given illumination. He thought the specification should be upon these lines, and not on the lines that had just been read.

Mr. Abady Reproached.

Mr. Frank Bailey (the Chief Engineer of the City of London Electric Lighting Company) was surprised so little reference had been made to the fact that if one did not like the specification, then it was possible to turn to Appendix "A." The remarks seemed to altogether ignore this important part of the document. However, there were three reasons for congratulation. The first was that the Society was selected as an impartial tribunal before whom the matter could be discussed, with the full knowledge that justice would be given all round. The second point for congratulation was that the paper had been the means of drawing from Mr. Trotter one more paper upon a subject of which he was a master. The third was the fact that so far the criticisms of the paper and the objections to the specification were so easily answered—so easily answered, in fact, that he could not do better than leave them to the author to deal with. He was, like Mr. Edgcumbe, a "whole hogger" in the matter of this specification. As one who had been present at all the meetings, it occurred to him that there were several points that should be brought before the present meeting. A number of men met together who had different views; and the care and persistence with which they pursued the negotiations was evident throughout. The electrical engineers recognized that they had a majority, but on inviting the assistance of some of the other Societies, the Institution of Gas Engineers in particular sent representative members; and during the whole of the proceedings, though their views were divergent, however much they disliked the specification, they expressed their views most clearly, and never uttered a single word that they had occasion to withdraw, and treated the fellow electrical members with the utmost courtesy. The very fact that they disagreed with the electrical members showed that they had freedom; and he should look forward to meeting the gas engineering members again, after they had had time to assimilate more the terms of the specification—especially Appendix "A." So far as the surveyors were concerned, there, again, they met with every assistance. It was somewhat astonishing that men having such large responsibilities should be able to find time to come to a comparatively new subject to them, and render some very practical assistance—so much so, in fact, that they had redrafted many of the clauses in Appendix "A." And they were even more proud of this than he was. At the time that the specification was in draft, and the majority of the Committee thought it a comprehensive document, he was afraid some attempt was made to prejudice the minds of those who were interested in it. He referred to the remarks made by Mr. Jacques Abady before the Institution of Gas Engineers in June last. What Mr. Abady then said was:

> "There is no good in 'footling' with the question by going on with the matter, or by having anything to do with a Committee which knows so little of the subject it has to discuss that it can confidently suggest that the specification of a minimum illumination is any guide as to what the relative lighting between one street and another may be. . . . I do suggest, with great respect to the Institution and the Council, that if this stupid illumination specification is persisted in, the only thing gas engineers have to do is either to write a minority report or withdraw, because this is unscientific and an inexact method of expression. I see that the Institution of Municipal and County Engineers have been asked to visit typical streets, for the purpose of classifying them. This seems to me to be a lame procedure. It is all very well to talk about illuminating engineers; but there are only two classes of people who understand what illumination is. One is the man who has to sell gas for lighting, and the other is the electric light man; and I do not think either of them cares to go to a municipal or county engineer. You cannot dogmatize upon that. You have the different standards of lighting, if it is a big shop or a road, and so on. So that it seems to me that the Committee on which your representatives sat have got into a rather hopeless mess."

This was a criticism of a confidential document. As a member of the Joint Committee, he thought Mr. Abady ought to be asked to withdraw these expressions.

Further Consideration Essential.

Mr. Edward Allen (Liverpool) said, as Vice-President of the Institution of Gas Engineers, he wished to express the appreciation of the Institution of the valuable work done by the Joint Committee. The association of electrical engineers and gas engineers was bound to be to the general advantage of the general public. One was glad to know that, although the too close association of electricity and gas sometimes led to trouble, the insulation of mutual ability and interest entirely prevented that kind of thing occurring in connection with the Illuminating Engineering Society. One hoped that for many years one might see the interests of the public in regard to illumination carefully looked after through the Society. He did not profess to be a judge of public lighting. Where he came from, the Corporation did the whole of the business themselves. But, as a man in the street, he would just remark that in Bold Street, where there were centrally suspended electric lamps at a great height, the light was less satisfactory than in other streets in the city. The minimum horizontal illumination he had no doubt was good; but when one was walking along the street, one did not want to be reading a newspaper—one wanted to see the man coming in one's direction, so as to avoid or recognize him. The general effect in narrow Bold Street was most unsatisfactory. It appeared to him that what the Committee desired to do was to produce a specification suitable for all the supplying undertakings in the country. But from what he read in the paper, and from the excellent remarks that had been made at this meeting and the previous meeting, it seemed to him that it would be a wise thing for the Committee to take this matter back for further consideration. The value of the Committee's work was very great. He hoped no member of the Committee would feel other than that those concerned in this matter were all grateful. He was satisfied, especially after the candid remarks of Professor Morris, that there was good reason for further consideration on the part of the Committee. He (Mr. Allen) trusted they would take the matter in hand again, and consider whether, in addition to minimum horizontal illumination, it would not be a wise thing to introduce other conditions into the proposed standard specification. He did not wish to repeat remarks (with which, he must say, he, as a photometrist, agreed very largely) that had already been made by Mr. Watson and Mr. Goodenough. He trusted in all sincerity that this matter would be threshed out, and that the country would have the advantage of an acceptable standard specification for street lighting.

Mr. Bailey's Reproof of Mr. Abady.

The Chairman observed that he had hoped Mr. Allen, as Vice-President of the Institution of Gas Engineers, would make some comment on what Mr. Bailey had said regarding Mr. Abady's remarks at the Institution meeting, because it was only fair to Mr. Abady to say, on behalf of the Council of the Institution, that the discussion in which he spoke was one invited by the Council without any knowledge in their minds that they were in any way committing a breach of confidence in instituting a discussion upon the specification, which had been referred to them for consideration. Mr. Abady was specially invited by the Institution to express his views; and any responsibility for this having been done did not rest with him, but with the Council of the Institution.

Mr. Allen: I agree with what the Chairman has said.

The Chairman further remarked that it was only fair that this explanation should be made, because, from what Mr. Bailey said, it seemed as if Mr. Abady was guilty of a breach of confidence.

Minimum Horizontal Plane, but Something Else Wanting.

Mr. Rogers Smith said his only connection with street lighting was as one of the ratepaying public. But he had had a little to do with the lighting of railway stations and yards; and he hoped a few observations on the specification as the result of this experience might not be considered irrelevant. Some of the criticisms he had heard that night, and some of those that he had had the advantage of reading in the report of the discussion at the last meeting, appeared to him to be levelled not so much at the specification for street lighting as to the principle on which the specification was drawn up. Now it seemed to him that there were two ways in which a specification might be drawn up. First, under the method adopted by architects and constructional engineers, in which they specified every detail of the work that was required, leaving to the contractor to carry out the details. In that case the man who drew up the specification was entirely responsible for the results. There was quite a different way of drawing up a specification which was largely used by those who specified machinery, which was simply to ask for the result, and leave to the contractor entire responsibility for the way in which the result was achieved. In such a case, of course, the contractor was entirely responsible for getting the result. Between these two extremes there were certain variations. The one thing that seemed to him to violate all the proper canons on which a specification should be framed was that, when all the details of the work a contractor was to carry out were specified, he was also asked to give the result, for which he then ceased to be responsible. The Committee had followed the second method entirely. They simply asked for the result, and allowed the contractor to obtain the result by any means he chose. He thought much of the criticism the specification had received had ignored this fact; and, coming from the Institution of Gas Engineers, it seemed to him that they were not prepared to trust the contractor to get, in the best possible way, the results that were asked for. They considered that he wanted more help from the engineer than the specification gave; and while they felt this—in dealing with only one illuminant, he thought very likely they felt it more strongly where more than one illuminant was being used in competition. If he were right in this view, he should like to refer to two points. First, to the principle of drawing up a specification which only specified result, leaving the contractor to obtain it in whatever way he felt inclined; and, secondly, if the principle of specifying illumination was correct was minimum illumination the right thing for which to ask? He would take the second point first. For the past seven years, he had designed all his lighting of railway stations and yards on the principle of minimum illumination, measured 4 feet from the ground; and in future he should adopt the metre height. One speaker had said that the horizontal illumination did not seem to him to be fair, because any quantities produced from it—such as diversity factor—were so much less than they were when measured from the direct ray, so that one should measure on the vertical plane. But what the Committee had been trying to do was to save people's time. Surely it was a pure convention that they only measured the vertical component of illumination, owing to the fact that, as Mr. Trotter showed years ago, if one got the vertical component on the horizontal plane, it was always greater. It was a mere convention; and, if they possibly could agree on one measurement that would take in

all the other things by implication, they should do so. As a railway engineer who had to deal with 3000 miles of line, with two assistants who could only occasionally be spared for photometrical work, it was impossible for him to personally undertake any regular photometrical work at all; and although people responsible for street lighting were in a much more pleasant position, time was also essential to them. If they could get one measurement which took in every possible source, if they had a plane which included reflection or light from other sources—if they could all agree they had got this, everything else followed as a matter of course; they would have a measurement which could be done in the shortest possible time, and at the same time, he thought it would be proved, give definite results. The horizontal plane was the only plane on which by one measurement such a result could be realized. In the case of one railway station in the Midlands, where experimental lighting was in progress, 30 per cent. of the lighting on one platform was received from lamps 35 feet away on the other side. At Paddington Station, the lamps on No. 1 platform supplied 16 per cent. of the minimum illumination on the opposite platform 48 feet away. If he could get this by one horizontal illumination measurement, instead of four or six, and a lot of arithmetic (in which he might make mistakes), and do it in one-tenth of the time, surely he was able to do much more in the way of measurement generally than he could do if he went about it in a roundabout sort of way. If only one result was asked for in a specification, it seemed to him that this one result must be horizontal illumination, and nothing else. He thought the contractor was perfectly justified in including all the effects he could get from other sources of light and from reflection, which were included by this measurement, and by this measurement only. But he now came to the other point, Was the principle of the specification right? He thought it was; but not for his railway purposes, if he was only allowed to include minimum illumination. His own method of procedure was to write a specification, and go and carry out the specification himself; and he must say that he could not trust himself to carry out the work successfully, to the satisfaction of people who wanted the light, if he only allowed himself to go by minimum illumination. The diversity factor had been referred to by other speakers; and he should like to emphasize—for railway work at least, and he thought it bore on street lighting too—the importance of including the diversity factor in such a specification as this. The way he would include it was that there should be a certain horizontal minimum and also a horizontal maximum, which should have *plus* and *minus* limits—the maximum limits should not be less than so and so, and not greater than so and so. Secondly, he should like to emphasize the point touched upon by other speakers—the question of glare. He would make a further restriction in the specification, and specify the intrinsic brilliancy of the source of the illuminant. There was an immense amount of very powerful lighting in the streets, much of which was, to his mind, a perfect disgrace. One's eyes were dazzled, and so closed up by the effect of the glare; while the low illumination midway between the lamps hardly entered one's eyes. Nevertheless, he believed in the specification as it stood; he intended to work to it himself. But for his own purpose he should have a term of "diversity factor," and also a term for "intrinsic brilliancy" of the lamps.

Road Surface and Not Metre-High Measurements.

Mr. W. R. Cooper was surprised to hear the term "diversity factor" in this connection; and he expressed the hope that Mr. Trotter would not lend his weight to the giving of this term to street lighting. If they were to have a term, why not use "variation factor?" He thought the objections to horizontal illumination were largely due to misconception. Horizontal illumination reached the limit soonest; if the horizontal illumination was enough, then the vertical illumination was enough. Some speakers objected to minimum horizontal illumination, because it could not be used in 80 per cent. of the streets. If in a great many of the streets they were only going to use beacons for lighting, then it would not much matter. There they could use candle power for most of the measurement, and that would give a definite result. But, as a matter of fact, a town councillor knew nothing about candle power. Certainly thirty years ago he knew nothing whatever about it; and he (Mr. Cooper) had an idea he knew nothing about it now, nor would he in ten years' time. The class of the street would be enough for the town councillor, and he would leave the question of the measurement of the illumination to the engineer who had to carry it out. Supposing they did not take horizontal illumination, what were the alternatives? They had heard a good deal about normal ray illumination; and there seemed to be an idea that this would lead to more definite results. This was certainly not so. One advantage of horizontal illumination was that it took count of everything. Much depended on the intrinsic brilliancy of the source, and at the same time on the ratio of the maximum to the minimum. This rendered the matter difficult to know what to do. The intrinsic brilliancy of the source might be brought down in the future; and therefore it was a little difficult to specify a certain maximum and minimum illumination. Then there was the question of the level at which the illumination was to be measured. One heard of 3, 4, and 5 feet, and 1 metre. In the paper, 3 ft. $3\frac{3}{8}$ in. was given. If one were not acquainted with the metre, one would marvel at the extreme accuracy. But he should like to ask the question why not measure the illumination at the street surface. It seemed to him the pedestrian used, quite as much as anything else, the horizontal illumination on the street surface. When driving a motor-car, one wanted to see what sort of street surface one was coming to. Mr. Cooper proceeded to point out the difference that measurement at a metre height made according to the height of the post in showing the illumination obtained on the surface of the roadway; and he concluded by hoping that the Committee would adopt road surface measurements, and not the metre level.

Trenchant Criticism by Mr. Abady.

Mr. Jacques Abady (London), in the course of his criticism of the specification, first of all thanked the Council of the Society for the opportunity afforded him as a visitor of voicing his views as to what, to him, was a very important subject. He would open his remarks by referring to a phrase which occurred in Mr. Trotter's paper. After saying that there had been various suggested forms of specification discussed, and that the Institution of Gas Engineers objected to the fundamental basis of the specification, the author went on to remark: "The Joint Committee, in these circumstances, were reluctant to take any further steps until an attempt had been made to review the problem, and to give an opportunity for a full debate upon it." It was because the Joint Committee had done this that he was able to be there that evening, and that those present were able to listen to the very interesting remarks that had fallen from the lips of those who had already spoken. But it really did strike him as being somewhat extraordinary—if he might venture to say so with very great respect and with a certain amount of egotism—that, if it had not been for his lamentable outburst at the Institution of Gas Engineers, from which speech Mr. Bailey had drawn a passage, and thrown it at his head, the specification which had found a good deal of tacit acceptance or aquiescence for want of any considered opposition might now, he believed, have been a *fait accompli*. It seemed to him to be an extraordinary proceeding to have drafted a specification, and bring it apparently down to the point of accepting it (if his view was correct), and then afterwards to hold a meeting in order to "review the problem." He was relieved to find that Mr. Trotter's paper was simply a summary of the deliberations and findings of the Committee, because he was well aware that he had expressed himself as strongly adverse to the specification. But, as the matter was put impersonally, it relieved him of the responsibility of having to deny any charge that he had been guilty of any disrespect to the learning or experience of any individual member of the Committee. And, speaking again personally, might he say that no one in the room shared more than he did admiration for Mr. Trotter, and the great amount of useful work he had done on the subject of illumination.

But he could not lose sight of the fact that it was twenty-four years since he (Mr. Abady) first did photometrical work, and some twenty years since he designed his first photometer; and from the aspect purely of years of constant testing and experience, he did claim the right to make his voice heard in no uncertain way, without being accused of being dogmatic or conceited in giving expression to his views as he did at the meeting of the Institution of Gas Engineers, and as he intended to do that night. He admitted that the phrase he then used, and which had been quoted, was not worded in the way he should have worded it had he known he was to be invited to attend the present meeting. [Laughter.] But still it was more a question of manners and phraseology than anything else. There were two ways of describing one's views. Mr. Winston Churchill, for instance, called a lie a "terminological inexactitude;" but he was not at all certain that the direct way was not the right and the best way after all. He might perhaps have put his views in a more polite manner; but honestly he could not go back from the opinion his words were intended to convey—viz., that this specification was absolutely and completely wrong from beginning to end.

Mr. Rogers Smith had said there were two ways of drawing a specification. There were—the right way and the wrong way. And this was the wrong way. The specification was completely wrong from beginning to end. When he got hold of it and read it through, and learned that the Society of Illuminating Engineers were going to discuss it, he rubbed his eyes, and wondered whether he was dreaming. The specification was far removed from anything that was likely to be of any service to any individual, and it was amazing that they were actually called upon to discuss it seriously. It was only right that he should give the reasons as to why he held these views. The first was this: The specification purported to deal with contracts for street lighting—with contracts made between a supplier on the one hand, and a council on the other. It set up a certain standard minimum illumination, measured in a particular way, measured in two ways—in two alternative ways if they liked. It admitted *ab initio* that 80 per cent. of the lighting of the country could not be measured under the terms of the specification. Was that a correct statement, or an incorrect one? Either it was right or it was not. Either one could measure 80 per cent. of the street lighting in the way prescribed in the specification or one could not. He said that it could not be done, and it was admitted by Mr. Trotter that it could not be done. Certain measurements and calculations could be made, and certain results produced. This was not the same thing; and it was his view and experience that the theoretical ascertainable horizontal illumination deduced from the sum of different illuminations did not agree with the horizontal illumination that was obtained by a single direct measurement. And he thought that

Professor Morris's explanation—he (Mr. Abady) would rather call it an excuse—was welcome testimony on this point.

The next thing was that the specification prescribed minimum illumination. Before, however, he went any further, he might deal with the point one speaker made—that although the specification set up a standard of minimum horizontal illumination, yet the position, heights, and distances apart of the lamp-posts had also to be given by the tenderer or contractor. What he (Mr. Abady) suggested was that, if they had two lamps 10 feet high, 100 feet apart, and a 100-candle power lamp on each and giving x foot-candles, the utility of these lamps arose because they were 10 feet high, 100 feet apart, and had 100-candle power lamps upon them, and not because they happened to give a certain theoretical horizontal illumination 3 ft. 3 in. above the road level. They could not divorce the one from the other. If there was any virtue in the lamp on the post, it was because it was a lamp on a post, and not because the lamp on the post gave an illumination reading made in a particular way. It followed that obviously the proper way was to measure the candle power of the lamps, the positions and heights of which had to be specified. The point was, as he had said, that the specification prescribed minimum illumination. Now he had been taught that before one could cook a hare it was necessary to catch it. The term minimum connoted a search for the minimum; and if it connoted a search for the minimum, it left a great deal to the discretion of the person making the test. He suggested that if one wanted to find the minimum one had to explore the streets, so as to know that one had got the minimum. He made this point with all seriousness. He would even sweep aside any want of *bona fides* on the part of a local authority—who wanted to penalize the supplier. In order to find the minimum, one would have to search for it; and that involved making tests other than the minimum. If this was true, then surely it meant that they could not go about the thing in the simple sort of way suggested—by merely taking a "cigar box" photometer from one's pocket, making a test, and then saying that is the minimum. One could not get the minimum without some means of definitely knowing whether or not it was the minimum. The argument urged in favour of the minimum horizontal—viz., that it was so simple and could be done instantly—therefore fell to the ground. The next point was the horizontal illumination. If the minimum was a matter which did not afford any basis of comparison between one street and another, then with how much greater force did the same contention apply to the minimum horizontal illumination. It was said "*quos Deus vult perdere, prius dementat;*" and whatever possessed the Committee in putting Mr. Haydn Harrison's table at the end of their specification, as evidence of the comparison of horizontal illumination, he could not imagine. If the minimum horizontal illumination was a proper test of the comparison of the lighting in one street, and if in another street it was the comparison of the lighting of a street in terms of itself, or of any standard, then the table had a bearing on the accuracy or otherwise of this as a comparison, because it was the basis on which 80 per cent. of the illumination of the streets was to be arrived at. He did not know that he could make this table look more absurd than had been done already, but he would try.

If they took lamps spaced 100 feet apart, with posts 10 feet high, the table said they required lamps of 95·5-candle power in order that the sum of two lamps should give a minimum horizontal illumination of 0·01 foot-candle. Suppose a badly-lighted street—lighted he would say by gas, and not by electricity, as he wanted to be impartial, and because the Chairman was avowedly a gas man—supposing it was lighted by flat-flame gas-burners (he did not know that there were many streets in existence that were so lighted), supposing then that somebody who was interested in the conversion of gas-lamps to electric lamps came along and saw these posts 10 feet high and 100 feet apart, and said to the local council: "I see that you have flat-flame burners consuming six or eight feet of gas, I can supply you with 100-watt lamps, which will give you 95·5 candles." He (Mr. Abady) was assuming for the moment that there was such a thing as a "one-watt" lamp. The gas man (who was not always such a fool as he looked) would turn up this illuminating engineer's specification, and he would find to his joy that if he doubled the height of his post, and put on incandescent gas-burners, using two cubic feet of gas an hour, he could easily get 43·8 candles. According to the table, the lighting would be precisely the same. Would that be fair to the man who wanted to light the streets by electricity? He (Mr. Abady) would ask any man in the room to say whether, as a matter of actual fact, whether as a matter of practical utility, lights of 43·8 candles on 20-feet posts, 100 feet apart, would give the same illumination as lights of 95·5 candles on 10-feet posts the same distance apart. Was it not an absurdity? He asked the Committee why not, without further ado, take the whole thing back and reconsider it? Look at the table from another point of view. Supposing they were going to alter the distance apart of the lamps; supposing they were 100 feet apart, and 10 feet high, and were giving a light of 95·5 candles, they had only to move them 10 yards (30 feet) further apart, and the table said that they would have to more than double the illuminating power in order to give the same illumination. Was not that ridiculous? If people would only thresh out the table, they would see what an absurdity the basis of comparison was, and that minimum horizontal illumination as a basis was altogether absurd. He could not say more.

He was glad to hear Mr. Cooper confirm his condemnation of horizontal minimum illumination; and he did so quite from another point of view—that was to say, to make a horizontal test 3 ft. 3 in. from the ground did not set up a proper degree of comparison between high and low posts. He (Mr. Abady) emphasized this point at the celebrated meeting at the Institution of Gas Engineers, when he took leave of his senses and manners. [Laughter.] And now he was confirmed months afterwards by Mr. Cooper, who represented an entirely different interest. While the basis of the specification might all be true theory, it was theory run mad.

Horizontal illumination never was, never could be, and never would be a true comparison between one system of lighting and another. He said with every confidence—he was rather an unassuming man with a fair amount of self-confidence [laughter]—that they could not dissociate the lighting effect first from the source, and secondly from what was being illuminated. They could not dissociate illumination from the source nor from the surface which received it. They saw everything not by the light which fell upon it, but by the reflection from it. They did not see anything in any other way but by reflection. On this point, again, and without any collusion, Mr. Cooper came to his rescue. Mr. Cooper said that the horizontal illumination that they wanted was the horizontal illumination on the street surface. Precisely. If this was so, then was not the value of this illumination dependent upon the nature and condition of the surface and the position of the source from which the light fell? The reason 3 ft. 3 in. was chosen was because it was possibly a convenient height. It meant nothing; it was nothing. They did not have horizontal illumination 3 ft. 3 in. high. The apparatus used for lighting the streets was not for the purpose of illuminating anything 3 ft. 3 in. high.

Having made these remarks, he did urge that he should be taken seriously, and not be considered discourteous because he was expressing himself with great emphasis. Mr. Cooper had made some interesting points as to the possible difficulty of measuring the illuminating power of lights fitted with dioptric globes, and had referred to the same difficulty with groups of lamps such as were used in what was known by their American friends as the "Great White Way." That difficulty could be got over by simply specifying and reading in "foot-candles on the normal at certain specified angles" just as in the Westminster specification, but omitting the calculation to convert this reading into candle-power of the source. It amounted to exactly the same thing.

He was in favour of the Westminster specification, with which he had something to do when he was Chairman of the Lighting Committee of that Corporation, because what they got on the photometer in the street was a true reading representing so many candles. It would be exactly the same thing, as he had just said, if they specified posts so many feet high, so many feet apart, and producing normal illumination of so many foot-candles at an angle of so many degrees. In the paper, Mr. Trotter asked what were the local authorities out to buy—and answered his own question by saying, "not lamps, not candle power, but illumination." If Mr. Trotter could phrase his sentence in this way, "What are they out to buy?"—"not lamps, not candle power, but minimum horizontal illumination," then he (Mr. Abady) would say there was some justification for the paper. He challenged Mr. Trotter to add these words. But he knew he could not, because, though the specification dealt with minimum horizontal illumination, Mr. Trotter knew very well that that was not what they were out to buy. The specification of the illumination left out of consideration everything else—such as glare, &c. It was evident from the sign given by the Chairman that he had come to the end of his time. But he must remark that the specification and paper simply bristled with inconsistencies. In one place it said an error, under normal circumstances, of 1° of angle of inclination of the photometer made an error of 10 per cent. Yet the specification said a photometer would be considered suitable if they could measure angles to 2°! Therefore, they could get 20 per cent. error from this source alone and still comply with the specification. Was not that another absurdity?

But whatever specification was adopted, if one were adopted, he should urge that Classes "A" to "E" should be revised. To put the point briefly, there was too much difference between the classes—that was to say, the middle Class "C," for instance, had a minimum of 0·04 foot-candle; so that a street that had a minimum of 0·039 foot-candle would come into class "B," the minimum for which was 0·025 foot-candle. There was thus a diversity of over 50 per cent. in the same class. If they were going to ask a contractor to comply with the illumination under these clauses, then they were going to give him a margin of 50 per cent. He knew what the reply would be—that the contractor was going to work to a specific horizontal minimum illumination, and that what he gave over this did not matter. This did not, however, affect the looseness of the specification, which he (Mr. Abady) could not help condemning from every point of view and from beginning to end.

Views from Several Quarters.

Mr. J. S. Dow gave the gist of a number of communications received from correspondents. One was from Professor Frankland, who thought the candle-power method a most difficult one to employ. To his mind, a simple method was to take illumination tests. He could not see anything in the specification about glare; and he did not think this should be left out. He felt so strongly on this question of glare that he thought the Society

should see whether they could not deal with it by Act of Parliament. Dr. L. Bloch considered the method of measuring illumination on the horizontal plane 1 metre above the ground was ideal. This was the method recommended by the Verband Deutscher Electrotechniker. But he did not agree with minimum illumination. To his mind, this did not conduce to the most correct conception of the value of street illumination. Minimum illumination alone was not sufficient to ensure a really well-lighted street. The desired method could be based on mean horizontal illumination. Dr. H. Strache, of Vienna, expressed approval of horizontal illumination in general; but he thought it should be supplemented. Dr. L. Bell (Boston, U.S.A.) took practically the same view, that, while horizontal illumination tests were good for general work, contracts involving large sums of money ought not to be settled on this basis alone. He believed a standard could be more easily carried out if more stress were laid upon the candle power at a fixed angle from the lighting units, to be furnished when burned under easily defined standard conditions of operation. Mr. L. B. Marks (New York) would go farther than the specification, believing that there should be some means of specifying glare. He preferred frosted globes to plain ones. Dr. C. H. Sharp (New York) expressed the view that the minimum horizontal illumination was hardly sufficient; and to test this would mean a photometric survey of the streets. He appeared to favour the mean of horizontal illumination, and taking the candle power. Mr. Preston S. Millar expressed disapproval of the test. To base the valuation of the illuminating effect upon the minimum intensity was to invite manipulation of light with the view to producing a relatively high minimum. Practically the specification resolved itself into a uni-directional rating for illuminants. He considered that they should endeavour to get the illumination of a street as a whole. Professor Bunte under certain conditions favoured the horizontal plane; and Professor Drehschmidt the vertical plane.

Mr. L. Gaster (the Hon. Secretary of the Society) said that he felt in a pleasant position that night in relation to the Society. At the two meetings, the specification for street lighting had been treated by those who were in a position to speak with authority on the system. He gave a history of the movement for a standard specification for street lighting. In the course of it, he emphasized that this was only a draft specification, and that, from the very beginning, it was understood that, before it took definite shape, it was to be brought before the Society for discussion, and then taken back again for, if necessary, final revision. All the Committee had to do at first was to prepare a tentative specification, with power to remedy it as circumstances demanded.

The Reply to the Discussion.

Mr. Trotter first acknowledged the vote of thanks passed to him at the last meeting. Those who had been present at the meetings were kind; and he was grateful. The Committee that had discussed this matter at many meetings was a unique one in this way. It consisted of four bodies; and they had most interesting discussions. It was observed at the last meeting that their gas friends were not well represented on the Committee. It was with great regret that they received the resignation of Mr. Doig Gibb, and further that no one was nominated in his place. They must, however, remember that their excellent Chairman was there—not as a gas representative, but as representative of the Society of Illuminating Engineers. To make matters more equal, he must confess there were several absentees. Two or three gentlemen never put in an appearance at all; and there were about five habitual absentees. The gas industry was not therefore so badly represented; and if the voting had been by Institutions and Societies, he thought there would have been nothing of which to complain. It was very important to remember that they were not there to discuss street-lighting or how to light streets. That might very well be the subject for many meetings of the Society. The spectrum of the light of lamps and ingenious shades might receive much attention. But they had here tried to describe street lighting, and in a way which he ventured to think was very practicable. Many had read the paper; many had apparently given it up in despair before they got to the specification, which, after all, was the important thing. He would, if he had the ability, take up the various subjects which had been discussed, rather than the speakers. But he was afraid he could not do so at this meeting; for it all required more consideration than he could give to it off-hand. He could only deal with the last meeting, and take some of the speakers shortly that night, and perhaps give a more detailed reply in the Society's "Journal" from the point of view of subjects.

He thought that the very first question which they had to deal with on the face of the specification was the minimum. He was glad to find that Mr. Watson, of Doncaster (who was a most useful member of the Committee, and whose acquaintance all of the electrical men were pleased to make), agreed with the minimum, but it was not at present clear how they could combine this with the direct ray, which he so strongly advocated. Mr. Clark considered it was difficult to find the minimum; and Mr. Abady thought so too. Nothing was easier. Had it not been so, members of the Committee could not have made 81 measurements in one evening. When one was out with a portable photometer, one could almost see where the minimum was, and then it was only necessary to check it. In expressing the view that it was difficult to find the minimum, Mr. Clark gave on the screen various curves. One of these—the main curve—gave a nice swoop down. Part of this was reproduced on a magnified scale; and in this way he got a variety of ups and downs as measurements. Mr. Clark was not hunting for the minimum; he was taking sections, as it were. If he (Mr. Trotter) remembered rightly, his main curve showed an almost obvious minimum for all practical purposes. He thought the magnified curve was rather out of court on this point. Mr. Clark also considered it probable that there were other factors than the horizontal minimum that influenced the judgment of the surveyors in classifying the streets by the eye. Now he (Mr. Trotter) would have great difficulty in defending the specification if it were not for the remarkable report of the surveyor members. And he was going to cling to this as a justification for his views. Mr. Clark thought it is probable other factors influenced them. What were they? The curious thing was that—putting the report of the surveyors down as they had it in the paper, and then putting the figures found by sheer measurement of illumination in the order of merit—they agreed absolutely. In his paper, it would be found that between Marylebone Road and Cambridge Street was the first demarcation. The first three—Cheapside, Whitehall, and Regent Street—were those which they excluded. From St. James' Street down to the Marylebone Road was the first class of the surveyors. Now from Marylebone Road to Cambridge Street there was a difference from 0·025 to 0·022 foot-candle. It did not amount to much; but it was the line drawn by the surveyors by the eye.

The reflected light provided by windows and houses had been spoken of; and one member referred to the importance of the direct ray in crossing the streets, and so on. But the surveyors must have taken all this into account. They were not making a minimum illumination test, so far as he (Mr. Trotter) knew; they were not looking for the minimum illumination; and unconsciously they must have taken all these things into account. The direct ray, he was prepared to admit, was most important; in the street he admitted that the direct ray was probably the most useful one. He would go further, and disagree with several of the members that the actual illumination on the horizontal plane was not of importance. Sir William Preece, about 1883, was the first to suggest that this was the thing to measure; and for many years afterwards it was what he (Mr. Trotter) did measure on the street, because with his early photometers one could work on the street. When the Committee came to consider the specification, and how they were going to describe, with the minimum amount of trouble, the lighting of a street, they felt they must, as Mr. Rogers Smith had said, take a conventional expression; and for various reasons they took the minimum illumination on the horizontal plane—not because it was the most useful, but because it was one that could be compared. With it one could compare streets with the greatest of ease. In the second volume of the Society's "Journal," Dr. Bloch, who was a gas engineer of great repute, had given a table of illumination in various streets in Germany. There was a lot of information in the table—height, candle power, spacing, and all sorts of things. What did they find in the last column but one?—"Minimum horizontal illumination." These were given in Hefner lux, of which twelve went to the foot-candle; and the measurements were all made at a height of 1 metre. So that they could compare any of the streets; and they could compare those Berlin streets with any street in London. Dr. Bloch there gave deliberately the minimum illumination which the borough surveyors took unconsciously as their criterion.

In the Society's "Journal" (Vol. 7), Dr. Bunte, at the German Gas and Water Engineers meeting, gave a classification of streets. He spoke of taking exact measurements; and he seemed to think they could not take exact measurements. He gave the lowest illumination permissible, which he (Mr. Trotter) supposed was the German equivalent for minimum illumination. In his classification, he gave for by-streets for little traffic 0·036 and 0·06 foot-candle; and in the fourth class 0·36 to 0·6 foot-candle. He (Mr. Trotter) had multiplied Dr. Bunte's figures by twelve. There they had two examples of experts comparing—one by minimum illumination and the other by classification. This measurement on the horizontal plane was a conventional expression, to which they could reduce their measured illumination. Engineers were all familiar with conventional expressions. When measuring the evaporating power of a boiler fuel, they took the water evaporated from it at 212° Fahr. Some engineers might say "what is the good of water at 212° for steam; it may be good enough for making tea." [Laughter.] But before comparing the evaporating properties, every engineer reduced them from and at 212°. He did not like trespassing outside his own line; but he believed gas was measured by reducing to 60° Fahr. and 30 in. bar. Measuring for calorific power, he found in the Gas Referees' annual circular that a reduction was made to 60° Fahr. and 30 in. bar. This gave a basis of comparison, though perhaps in the course of the experiment one might not get to that temperature or pressure. In the same way, having obtained the light on the direct plane, they had simply to use a table of cosines to convert to the horizontal. Perhaps that was too scientific; but it was rather an insult to say so to anybody. However, let them put in, if they could, something which would enable them to use the direct ray as advocated by so many engineers. He did not see how they were to be compared, or how they were going to be added together. Dr. Bloch, who had written upon the horizontal plane, thought it was the plane upon which all illuminations automatically collected themselves. There must be lighting from cross street lamps and corner lamps, reflection from houses, and so on, which were all matters that it was said had not been taken into account in the specification. He could only say the surveyors in examining the illumination

of the streets must have taken them into account; and they agreed precisely with the proposed classes. It was said the direct ray ran into larger figures; and therefore it was easier to measure. It was a very good idea; and one reason Mr. Harrison used it so frequently was that it was easier for photometrists to make measurements. If they possibly could they should therefore try to include it.

Coming to that evening, their Chairman had given to them six reasons against the minimum horizontal illumination test. One of the reasons was ease of comprehension, and interest by the man in the street. He (Mr. Trotter) did not know that the man in the street would bother about it at all. But when a town council had to ask for street lighting, they could under the specification take a light such as they had in St. James' Square, or somewhere else, and they would probably be able to imagine their own streets lighted to a degree of any specimen, better than they could by bothering about candle power, spacing, and other matters. This was not a matter so much for the man in the street as for those who had, in the first place, to order the illumination, and those who, in the second place, had to provide it. The question of leaving nothing to the option of the contractor, he did not agree with; for the reason that it meant that the lighting would have to be designed, the methods invented, and the details proposed by the borough surveyor. Unless they were going to have a class of men of great originality, they would never get any measurements at all. If they were shown what the result was going to be, there was some chance not only for originality in height and spacing, but in the use of different kinds of lamps, reflectors, and methods, which he thought would very likely produce what they all wanted—better illumination everywhere. Surely the competition between electricity and gas had been one of the most important things in modern street lighting, and had led to great improvements. Mr. Goodenough had suggested that when one was hungry, one did not go into a place, and say "I have a certain standard of hunger, which I wish to be appeased." One went and ordered a dinner. There was another way of doing it, which some of them who travelled on the Continent, and were not very familiar with bargaining and so on, found useful. It was called *prix fixe*. One knew how more satisfactory that was than venturing on *a la carte*. If they were going to light their streets *a la carte*, and going to specify all the fish, entrée, and everything else, the whole result would be a very serious responsibility in ordering that particular dinner, and probably the result in the end would not be much better than if one allowed the *chef* to arrange the menu of the table d'hôte.

Another objection was it left the matter open to few and high lights. Some motor people he believed liked few and high lights; but he did not think the absurdities were going to be realized. Mr. Harrison in his table had got certain formulæ. The table went from one extreme to the other, "like some of us extremists do." It was stated that these were extremes; and that they were calculations from formulæ. The results had been held up as a laughing-stock in the case of the lamps at enormous heights. He had not made measurements himself. But he fancied these tall posts were going to cost something; and from what he heard from practical engineers, they would take care that people did not put up these high posts. The variation factor would also take care of itself. It was also suggested that under the specification there would be small lamps and gloomy lighting—just sufficient to meet the specification. He believed the costs of the lighting units, the cost of the lanterns and posts, were going to stop that. Then as to the 20 and the 33 per cent. error. He had not come across this himself; and he would have to attend to the point another time.

As to the specification being useless in 80 per cent. of the work, he did not think so. There were plenty of clauses in it, apart from the purely illumination clauses, which could have wide application; Professor Morris alluded to his experiments. They were not referred to in the paper, because he (Mr. Trotter) knew there was more to be said about them. Professor Morris told them there was a difference of 1½-100oths of a foot-candle which came into the question. These were questions of strong lighting probably; and he (Mr. Trotter) did not think they had any bearing upon the present matter. Professor Morris suggested that, in addition to the minimum, there might be a certain average or mean hemispherical candle power. This was a matter which must receive the further consideration of the Committee. Mr. Bradley's remarks on the basis of his twelve years' experience, of course, also demanded very serious consideration. The specification that the Committee had drawn up was not a Westminster specification; it was intended for the whole country, and probably also for the Continent. It was intended for the widest purposes. The question of glare had not been overlooked; and it could be dealt with under section 8, in which particulars of the lighting units were asked for. He humbly accepted the rebuke as to diversity factor; "variation factor" was undoubtedly the better word for it. Mr. Abady believed the specification would have been a *fait accompli* if his view was correct that it was on his account that it had been further discussed. "If it were not for him"——

Mr. Abady: I think you have not quite followed my statement. The specification had been drafted and submitted to the two Institutions, after having been adopted by the Committee responsible. At the meeting of the Institution of Gas Engineers last June, the President asked me to address the members on the subject, which I did in perhaps rather forcible terms; and I believe that that had an influence upon the matter being further dealt with. That is all I suggested.

Mr. Trotter remarked that in his paper he stated that the Institution of Gas Engineers could not agree with the fundamental basis of the suggested specification; and the paper proceeded: "The Joint Committee, in these circumstances, were reluctant to take any further steps until an attempt had been made to review the problem, and to give an opportunity for a full debate upon it." It was perfectly clear from this that the further debate which they were now ending was contemplated. Reverting to the specification, and the point that it was not suitable for 80 per cent. of the streets, he said that candle-power measurements were provided for these low illuminations; and what they wanted to do was to screw-up this class of lighting. Mr. Abady also said that they had to explore the streets to find the minimum. He (Mr. Trotter) would like to take him out, and show him how it was done. Mr. Abady also said that minimum horizontal illumination was absurd. It never was, nor ever could be, a fair comparison. He again cited the classification by the surveyors, and how this confirmed the minimum horizontal tests. After a further reference to glare, in which Mr. Trotter mentioned that the lighting outside some tobacconists' shops was a perfect scandal, he said he was sorry after all the trouble he had taken to write on this subject that he had not yet been able to convey to Mr. Abady what illumination meant. He was still thinking he (Mr. Trotter) was talking of brightness. He said illumination was dependent upon the nature of the surface. The illumination received on a dark and light surface were identical from the same source; and he was not talking about brightness at all. Mr. Abady also spoke of the classes of streets being wide—having a margin of 50 per cent.; but then they must have some classification, and therefore some division. It was a matter that would correct itself with some small amount of common sense. In concluding, Mr. Trotter thanked those present for their patient hearing.

The Chairman remarked that they had already thanked Mr. Trotter. It was only the clock, however, that made him resist taking advantage of his position as Chairman, and replying to Mr. Trotter. However, anything further that anyone had to say could be communicated in writing.

[A letter from Mr. Goodenough will be found to-day in our "Correspondence" columns, p. 407.]

EAST HULL CARBONIZING PLANT EXTENSIONS, WITH NOTES ON WORKING RESULTS.

By R. Nelson, of East Hull.

[A Supplementary Paper read before the North of England Gas Managers' Association, May 3.]

In the paper which I had the privilege of laying before this Association at the meeting held in May of last year, a description of the Dessau vertical retort and auxiliary plants, as erected at the works of the East Hull Gas Company, was given. It is thought desirable that further working results, obtained since that date, be presented as a preliminary to the discussion.

As arranged at present, the vertical plant is, during the winter months, operated in conjunction with a hand-worked horizontal house. But from April 19 to Oct. 25, 1912, the verticals only were in use; and it is to this period—*i.e.*, a continuous run of 27 weeks—that the working statement now given applies. This, I think, will be admitted to give a fair average of the results obtained with the installation.

The vertical plant was put to work at the beginning of October, 1911; so that it has now been in operation for over nineteen months. During this time, some of the settings have been let down (due to summer conditions) and re-heated; while others have worked continuously since the commencement.

Working Statement—April 19 to Oct. 25, 1912.

27 weeks' continuous run.

Coal carbonized	9,996 tons
Gas made (corrected to 60° Fahr. and 30 in. bar.)	141,488,400 cub. ft.
Gas made per ton (corrected)	14,154 "
Average illuminating power (No. 2 "Metropolitan" burner)	14·89 S.S. candles
Average calorific value—gross	551 B.Th.U.
Average calorific value—net	500 "
Candles per ton	42,150
B.Th.U. per ton	7,798,854
Sperm value, in lbs. per ton	723
Sulphur in purified gas, in grains per 100 cubic feet (oxide only used)	26·6
Ammonia in purified gas, in grains per 100 cubic feet	0·23
Naphthalene in purified gas	trace only

The average composition of the purified gas (daily tests being made during the above period) was—

	Per Cent.
Carbon dioxide	2·56
Heavy hydrocarbons	3·28
Oxygen	0·36
Carbon monoxide	8·27
Methane	27·95
Hydrogen	49·82
Nitrogen	7·76

The coal used, during all this time, was South Yorkshire

silkstone—a mixture of "unscreened" and "cobbles" in about equal proportions.

Twelve-hour charges were worked throughout, with two hours' steaming.

It is to be regretted that reliable returns pertaining to the yield of tar and ammonia have not been ascertained, as during the past summer one of our storage tanks was found to be leaking; and until this can be remedied or other provision be made, accurate figures are not obtainable.

With regard to naphthalene complaints in the district, previous to the installation of the verticals as many as 900 complaints per month were being dealt with; while during the past twelve months the total number of stoppages in services was 20.

The whole of the plant continues to give entire satisfaction.

DISCUSSION.

Mr. C. Dru Drury (Sunderland), in opening the discussion, said he thought the thanks of the members were due to Mr. Nelson for his interesting paper; and their sympathies were also due to him, because he had had to wait so long for the discussion on it. However, in these circumstances, they had had the advantage of a supplementary paper, and also the opportunity of looking up the original one. He thought their congratulations were due to Mr. Nelson for the very compact installation he had designed, for the workmanlike arrangements of the plant, and for the highly satisfactory results obtained. It seemed to him (Mr. Drury) to be a very ingenious arrangement to have combined the telpher service so that it not only handled coke, but was able to store coal and move it again from the stores to the breaker. In this way he thought the service was most valuable. He considered Mr. Nelson's versatility was shown in the different forms of power he had introduced for working the installation. In the limits of a small house, he seemed to have steam, gas, electricity, and hydraulic power for carrying out his various operations; and, with these four, he (the speaker) thought Mr. Nelson ought to obtain the very best results. Of course, the whole of these retorts were of later design than those at Sunderland; and, as such, they presented singular advantages. The floor area occupied by the retorts was less; and the capital cost was also less. The working costs were distinctly reduced; and the fuel account appeared to be less than he (Mr. Drury) could come down to. He thought Mr. Nelson's additional charging doors to the retorts were a distinct advantage; they enabled him to place his coal rather more lightly into the retort than was done by simply dropping it in from a shoot, such as was originally designed. They also, he thought, reduced what was made a good deal of—the smoke bogey in the charging of the retorts. Personally, he did not think there was much in the smoke question. He had stood on the other side of the river bank to Ayres Quay when they were charging the retorts, and watched the smoke come out; and it disseminated so quickly on passing through the ventilator that very little was seen. However, the smoke was distinctly in evidence; and as far as he could judge from the East Hull charging shoot, it must be very much reduced. The men were also kept out of the smoke, which was a great advantage—not that the men troubled very much about it. They, at Sunderland, had thought of this, and introduced one or two arrangements to avoid it; but these involved a little more trouble in the handling, and the men preferred the old method. The charts showing the calorific value were interesting, and bore out what the speaker had found in investigating the matter. Valuable as was a system which produced a regular quality of gas from hour to hour, still they found that, with even one holder working in and out, the waves of the various constituents were entirely got over, and they were able to send out from the single holder an even quality of gas in the twenty-four hours. Mr. Nelson's results in the make of gas per ton appeared to be very satisfactory—14,000 cubic feet; but it would add to the interest of the paper if Mr. Nelson would tell them what make he obtained ordinarily from the same class of coal in horizontal retorts, and what advantage he derived in this respect from his verticals. Mr. Nelson's results largely confirmed those he had experienced in the vertical system, working for three years, and carbonizing about 60,000 tons in this period. They found a large increase in the make of gas, and also that they were able to maintain the calorific power, even after considerably reducing the illuminating power. He further found that the carbon bisulphide was less by one-half than that from the same coal carbonized in horizontal retorts, but not entirely filled. The naphthalene deposits in gas made in vertical retorts in their case had not been found at all. They had examined the plant from beginning to end, and had not seen the least trace of deposit. They emptied their purifiers in the open; and at one time in the winter the snow was lying on the covers. But even with that there was no sign of naphthalene, and none so far as they could trace in the district. The absence of stopped pipes was another great advantage; and with regard to tar and ammoniacal liquor, they secured an increase of 10 per cent. in tar, and from 15 to 20 per cent. in sulphate of ammonia. With a highly bituminous coal, such as they had to treat, there were distinct advantages in the Dessau system. It was a positive system. They started with the retort empty; they filled it full; the coal remained there till it was carbonized; and the coke came out when it was done. Another advantage was that they did see the inside of the retort pretty frequently. He did not want to go into the question of continuous and intermittent retorts; but it did "get his back up a bit" when he heard the continuous system described as a scientific system, as if the other was a non-scientific system. If the non-intermittent was the only way to obtain a scientific result, he wanted to know where human beings came in. No doubt many men produced a fair amount of gas continuously. But they all took their meals intermittently; and if they had to take them continuously, they would have to be provided with an automatic mincing machine with side-fitted attachments. [Laughter.] He maintained that the Dessau system was very reliable, and very flexible. There was a big advantage in being able to steam the retorts as they did. Whether it was the most economic way of making water gas, was no doubt, open to question; but it did give one great facilities for regulatiag the quality of the gas, and keeping the make at a considerably lower cost. Of course, the coke was denser, especially where they had bituminous coal; and when in a state of fine division, such as the coal they used where they had on an average 35 per cent. passing through a screen, it did tend to make the coke denser. In Sunderland, at first, there was great prejudice against this denser coke; but it was now largely overcome, and at the present moment they had no difficulty in disposing of their annual make. He thought his results had been fully confirmed by those of Mr. Nelson, and congratulated that gentleman on his paper and the figures he had put forward.

Mr. G. S. Sayner (Harrogate) complimented Mr. Nelson on the excellent results he had been able to obtain in his plant, and said he was sure every member would congratulate him on his admirable paper. Mr. Drury had answered one or two questions he was desirous of having elucidated; but he would like to ask Mr. Nelson what induced him to adopt this plant—whether it was a particular coal to carbonize or the coke-market conditions. At any rate, he had been fully justified in its adoption by the results published in the paper. He would like to know if Mr. Nelson had any control of the density of the coke by the steaming, and whether he had found the coke was as marketable and profitable as that from the ordinary horizontals—whether or not it affected the coke market. He would also be glad to hear, when the retorts were let down in the summer conditions, what (if any) repairs were required, and how the cracks in the retorts behaved themselves as compared with horizontals.

Mr. H. H. Collett (Sunderland) said he should like to join in the congratulations to Mr. Nelson on the up-to-date installation he had put up. Those who had had the pleasure of seeing it would, he was sure, agree as to the well-considered lines on which it had been designed. The somewhat lengthy period which had elapsed since Mr. Nelson read his paper had been productive of one important point, in that it had allowed him to supplement the particulars given in the paper by a further 27 weeks' working, which he (Mr. Collett) considered very valuable. They not only substantiated previous results, but had been obtained under ordinary working conditions, and not what might be termed test conditions. It was a matter for regret that Mr. Nelson had been so unfortunate with his wells, as the tar and liquor results would have been most valuable for comparative purposes. He would like to ask Mr. Nelson whether he had made any further estimations of the fuel percentage, and whether he had been able to reduce it below the 16 per cent. mentioned in his paper. He (the speaker) must confess to feeling some slight disappointment at this result. Since the figures which had been given by their German friends, he was in hopes that this newer figure would have shown them a better result. Still it was by no means a poor one, especially when they considered that 26 lbs. of fuel were required per 1000 cubic feet of gas. After three years' experience in working with settings of vertical retorts, he could fully endorse all that Mr. Nelson had said with regard to their responsiveness and their flexibility. Regular heats were easily obtained and maintained. The adjustments for getting properly graduated carbonizing heats in the retorts were readily made; and the whole of the retorts could be very easily heated. It was, of course, quite a well-known fact that regular and even heats were a *sine quâ non* where the best carbonizing results were desired, and they assisted in prolonging the life of the retorts. The intermittent system gave the advantage that one was able to regularly inspect the heats in the retorts every day; and, in the light of these observations, any adjustments could be made. The latest forms of retorts had been fitted with step grates, which had very considerable advantages in reducing the amount and arduousness of the labour required. But the greatest advantage, to his mind, which these grates appeared to have was the benefit that must accrue from the constant conditions which appeared to obtain in a producer fitted with them. The Dessau retorts were fitted with the old horizontal bar grates, and it was possible to get practically a straight line of 18 per cent. on the waste gases; but this was only obtained by keeping the fires as regular as possible, and by careful and frequent supervision of the air and draughts. From what Mr. Nelson had said in his paper, the amount of supervision required with the step grates was very small indeed; and the cleaning of the fires every twelve hours appeared to be no more than the pricking of them. At one installation fitted with these grates which he inspected some time ago, he was told that they had never been clinkered since they started, and they had then been running eighteen months. The average temperatures in the combustion chambers and retorts, as given in the paper, were, he considered, low; and the author should reap the benefit from them in getting a good long life out of them. The retorts were rather small, and when any repairs became necessary he was afraid Mr. Nelson would find himself somewhat handicapped. The retorts used at East Hull were small, but were some 5 inches longer in section, and a thin man was just able to work inside

them. The labour costs were low, especially when one considered the size of the installation; and with a larger one they would probably be further reduced. One point which would affect all installations of this character was that it reduced the amount of labour. But as the number of beds was reduced the labour could not be reduced in anything like the same proportion, and the charges per ton would go up very rapidly indeed. Perhaps Mr. Nelson would tell them how many carbonizers he had to employ when he had three beds at work under summer conditions. Mr. Nelson was, he thought, to be congratulated on the charging machine he had evolved. He would also like to ask Mr. Nelson if he had had any trouble with his hydraulic gear, and whether he had found that there had been any excessive wear and tear in conjunction with it.

Mr. J. C. BELTON (Chester) said that he had been asked to make a few remarks on the paper, and did so with pleasure, but also with a great deal of diffidence, because he had had no experience of vertical retorts. It was easy for an outsider to be a critic, but to be critical with correctness was a different matter, if the critic had not had experience. He congratulated Mr. Nelson on his paper. It appeared to him to be a complete, concise, and clear description of his plant, and one which needed very little information to be sought by those who liked to know all about a plant. With regard to the working results, he had compared these, with the results for the 27 continuous weeks' run given in the supplementary paper, and they agreed very closely with those given in the original paper. So he would confine his remarks to the results in the second paper. He noticed that, in the first place, the make per ton was given as 14,154 cubic feet, of 14·89 candle power; and he presumed it was tested on the Carpenter No. 2 burner. This being so, he would like to be informed what the statutory illuminating power was for East Hull. because they all knew that 15 candles on the No. 2 burner would not give more than 12 candles on the "London" argand; and it seemed to him the large increase of make per ton shown in these results was due, not entirely to the plant as such, but to the fact that more had been taken out of the coal, and the illuminating power thereby reduced. Of course, they could get a large increase in their make by reducing the illuminating power; but they could not do it without. If the same illuminating power had been obtained with the vertical retorts as was secured with the horizontals, how would the yield per ton have compared? It appeared to him that the illuminating power was sacrificed for the calorific value. They were all trying to work in this direction; but, at the same time, they could not lose sight of the fact that they had a large number of consumers who were simply taking their gas for illumination purposes, and not all of them using incandescent burners. They must remember their obligation to the flat-flame gas consumer; and if they supplied him with 12-candle gas, and had a statutory illuminating power of 15 candles, he would not say what he thought. He would leave it to their consciences. The calorific value at Hull was given as 500 B.Th.U. net; and this figure was obtained, he took it, only by the continuous recording of the Beasley calorimeter. He had had some experience of this instrument, and would be sorry to place any faith in its indications, unless it was corrected day by day, because he found that it was continually getting out of order, and needing careful adjustment. Unless these records were very carefully corrected by some other calorimeter, they were hardly to be relied upon. The sulphur in the purified gas seemed to him to be remarkably low. He supposed this was one of the particular advantages of working which was claimed by the advocates of vertical retorts; and he did not dispute it, but congratulated them upon it. He would be glad to see it in his own works. Mr. Drury raised the point as to the amount of fuel. Sixteen per cent. seemed to him (the speaker) a very high figure. He would like to ask whether it was considered that 15 or 16 per cent. was the normal amount of fuel required for the vertical system. He liked to be modest; but his did not, at any rate, exceed 10 per cent. with horizontals and manual labour. He did not see why 16 per cent. should be necessary in verticals, when they could work the horizontals with at most 10 per cent. The disappearance of naphthalene was a matter upon which both Mr. Drury and Mr. Nelson were to be heartily congratulated; but Mr. Nelson had not stated whether he had any apparatus on his works for the removal of naphthalene—such as a naphthalene washer—or whether the absence of naphthalene was attributed entirely to the vertical retort system. With regard to the illuminating power, was any system of enriching used, or was this gas from the vertical retorts sent out as made? Of course, they had water gas produced in the verticals; but it was possible to enrich it by the addition of water-gas plant, and the paper did not make it clear, as far as these questions went, whether such machinery was used—whether water gas was added, or whether the gas was sent out straight. Of course, if the class of consumers was such that it was only necessary to cater for calorific value and low illuminating power, he had nothing to say; but if, on the contrary, there was anything like a large class of consumers using flat-flame burners, it was a disadvantage to supply gas of such low quality.

Mr. F. P. TARRATT (Darlington) failed to see any reason why Mr. Belton should put such great stress on the question of the illuminating power. They, as gas engineers, were faced with keen competition. Why they should advertise to the world that they were prepared to supply gas of a high illuminating power, he was at a loss to understand. With coal at present prices, it was their duty to get as much gas as possible. Even if they made 15,000 cubic feet per ton, what did it matter when their calorific value was kept up to a figure such as was shown in Mr. Nelson's paper? He failed to see any reason why, if such towns as Middlesbrough could supply 12-candle gas, and if they could gradually bring their illuminating power down to this figure without causing difficulties in other ways, they were not entitled to do so. If they gave their consumers a regular illuminating power and a regular calorific value, there would not be complaints. It was variations that caused trouble. The reason why vertical retorts had made the advances they had, was the endeavour to obtain as high a make as possible; and he certainly thought this was the line on which they should go. The results Mr. Nelson showed in his paper were greatly to the credit of any vertical system, whether intermittent or continuous. Mr. Nelson had not a large plant. In the summer time, the plant required to supply his district was reduced to quite a modest size; and if he could obtain the results he was doing, he was certainly to be congratulated. With all due respect to Mr. Belton, he did not agree with his remarks in regard to illuminating power and make per ton. Most men agreed that, where they had horizontals, they had reached their limits. One of the difficulties in the London district had been to get the illuminating power down; and this was a reason why verticals had made such advances.

Mr. BELTON said he thought Mr. Tarratt had misunderstood one of his remarks—that was where the statutory illuminating power was fixed above that which was being supplied, the practice was questionable, whatever the calorific value might be.

Mr. TARRATT said he did not suppose Mr. Nelson was supplying an illuminating power below the statutory standard.

Mr. NELSON: Certainly not.

Mr. T. HARDIE (Newcastle) added his congratulations to Mr. Nelson for his paper, and also upon the excellent results he had been able to get from his Dessau system. His Company must be greatly indebted to the North of England for the results they had obtained from their system with coals from Yorkshire and Durham. Mr. Nelson told them in his paper last year that he hoped to test with a different class of coal in the coming summer. But, unfortunately, it seemed as though he had kept to the one kind of coal; and therefore they had not the advantage of knowing whether he could get equally good results with other classes than the special coal which he had used. With regard to the arrangement of the plant, Mr. Nelson was certainly to be congratulated. He had laid it out in a manner which made for very economical working. Mr. Drury had referred to Mr. Nelson's telpher grab for dealing with coal and coke; and it would be interesting if Mr. Nelson would tell them the quantity of coal he could remove by the grab, and its capacity and the weight he could convey from the store into the coal-breaker. Another point in the paper was the use of asphalt for making his coal-breaker pits water-tight. He (Mr. Hardie) had used this in a similar way with great advantage; and he thought it was one of the best methods of keeping water out of coal-breaker pits, where they had this danger. One thing, however, must be remembered, and that was that they must have a very substantial body of material on the inside of the asphalt. It was best to keep the asphalt as near to the outer wall as possible, so that they got the full strength of the wall itself to stand any pressure that might come on the asphalt. Another point with regard to the installation itself was the great care which Mr. Nelson had taken to duplicate every portion of his plant. But in one respect—that of the gas-engine for developing his electric power—he (Mr. Hardie) thought that where Mr. Nelson had installed such a large engine—a 105 B.H.P.—it would prove rather an extravagant method of generating power, when the greater part of it seemed to be required only for driving the coal-breaker. This required only about a 20 B.H.P. engine. The results had been pretty well talked about; and he thought they had been a surprise to most of them. They only wished they could do as well. The calorific value of the gas was exceptionally high, if they took into account the author's low candle power; and he should almost have expected, from the analysis he gave of the gas, that the calorific value would have been even higher. The whole of his gas analysis was very good, because he had only 10 per cent. of inert gas in it—2·5 per cent. of carbon dioxide and 7·7 per cent. of nitrogen. He must agree with Mr. Tarratt that in this respect the system showed that it really produced a gas which they had been endeavouring to obtain for some time. With horizontals, they certainly could not produce so large a make of gas with anything like an equal value taken calorifically. With regard to the fuel account, he was also surprised that Mr. Nelson was able to obtain the make of gas stated, with so low a fuel account, because it was very difficult to find out where the water gas was made. He evidently used very little fuel for the purpose of maintaining the heats to make this gas, and he must get it very cheaply indeed to be able to produce so large a quantity of gas and at the same time have 16 per cent.

Mr. NELSON, replying to the discussion, thanked Mr. Drury for his kind remarks in connection with the plant they had put down at East Hull. They, of course, followed Mr. Drury's example with regard to introducing Dessau vertical retorts; and these had not only given them all they expected, but had really exceeded their expectations so far as the results obtained were concerned and the saving of costs came in. He agreed with Mr. Drury that the question of the smoke of Dessau verticals was a mere matter of sentiment, neither more nor less. The calorific value chart was got out simply to see whether they were securing the same result

as they had obtained at Sunderland. They had secured, and continued to secure, this result. Mr. Drury asked for the make of gas per ton with the same coals as those used in horizontal retorts. Their horizontal retorts were hand worked—part of the setting regenerators, and part generators. Under these conditions, using the same coal as at present, their make per ton was between 12,300 and 12,400 cubic feet. Mr. Sayner asked their special reasons for adopting Dessau retorts. He did not think the reasons were very special—it was an all-round reason. The control of the density of the coke was due, he thought, to the method of charging more than to the length of time of steaming—that was, according to how they put their charge into the retort. According to the density of their coal charge in the first place, so was the density of their coke going to be. As to the sale of coke in the winter months, they were making both classes—vertical and horizontal coke; and they were asked to supply in a good many cases vertical coke, and not horizontal. Seeing that the whole of their coke sales in East Hull were purely local, and that to-day they had no coke at all on hand, it proved that the vertical coke was satisfying the needs of their customers. As to the question about letting the retorts down for summer conditions and for repairs, he might say there were no repairs. The retorts were not touched; they did not need it. The only cracks visible were some air cracks. The two beds were re-heated in the same condition as when they were let down. He must also thank Mr. Collett for his remarks, seeing that he had charge of similar plant. What they wanted to give in this particular instance were not test conditions, but results obtained under working conditions; and he thought they had managed to do so. It was certainly a matter of regret that they could not give absolute figures for tar and ammonia; but until they could get figures that they knew to be accurate, it was no use giving approximate ones. The fuel account they had not been able to reduce below 16 per cent. They were still using this; but he did not think it could be considered very high. They had worked all this time with twelve-hour charges and two hours steaming; and this must be taken into consideration when considering the fuel account. As far as the working of the step-grate furnaces was concerned, the cleaning was in the hands of the carbonizers. It consisted of pricking the fire and raking out the clinker. The only adjustment required with a step-grate furnace, to get the settings in normal condition, was a simple adjustment of the flue draughts. The primaries and secondaries had not been touched for a considerable time. As to small retorts being difficult to repair, he said a man had been inside. He was certainly not a very big man, but an average sort of chap. He did not think there would be any difficulty in this respect in future. As to the reduction of labour on reducing the number of settings, the house containing five beds working in the winter was worked with four carbonizers only—two per shift, one man on the top, and one on the bottom. They could not very well do with less than one, so that as the settings were being let down the labour charges increased proportionately. The hydraulic gear had given them no trouble up to now. The whole of the original gear was there; and with the exception of packings of hydraulic rams nothing had been done. Mr. Belton asked a question as to the statutory illuminating power under the East Hull Acts. It was 14 candles, tested by the No. 2 "Metropolitan" burner, and had been so for six or seven years—that was, about four years before the verticals were introduced. The gas supplied to the town at that time was as nearly as possible of the same quality as they sent out now; so that the increased make, so far as the present results were concerned, did not mean a reduction in the illuminating power. The calorific value was ascertained by Beasley's recording calorimeter, which was checked every day. They had no washer, nor any other means of removing the naphthalene; the gas was sent out just as it was made. Neither had they any carburetted water gas to back-up the gas made in the retorts. The gas as made in the vertical plant was being sent out into the district without interference between the retort-house and the governors. Mr. Hardie pointed out that, in the original paper, he (Mr. Nelson) expected to be able to test the plant with various classes of coal. He did at that time; but unfortunately the different circumstances between the reading of the paper and the present time were such that they had to stick to the one class of coal, and had not had an opportunity of testing any other. The capacity of the grab used with the telpher, in conjunction with the breaker and the elevator, was 25 to 30 tons of coal per hour. The grab could keep this going easily. As to the duplication of plant, an engine and generator were put down of sufficient size to generate power for a 2 million and not a 1 million house; and, so far as the total duplication was concerned, they had in the same house a motor generator set worked from the Corporation plant at 440, driven at 220.

High-Pressure Central Suspension Lighting in Birmingham.

To demonstrate the advantages of central suspension lighting for the principal thoroughfares of the city, the Birmingham Corporation Gas Department are carrying out a scheme which provides for the erection in Paradise Street of four high-pressure three-burner lamps, each of 4500-candle power, suspended in the centre of the roadway from wire ropes carried across the thoroughfare. No flexible tube is used at any point (the gas being conveyed to the lamps by means of ordinary piping); and the lamps can be raised and lowered without being entirely extinguished. The two taps which are already in position have materially improved the illumination of the street.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Street Lighting Specification Discussion.

SIR,—Mr. Trotter in his reply to this discussion last night [*ante*, p. 397] laid great stress upon the fact, which he considered went far to prove the soundness of the specification, that the classification of streets made by the surveyors as the result of an inspection of their lighting by night, was in agreement to a considerable extent with a classification of the same streets according to minimum horizontal illumination measurements—though there were, it should be noted, very material divergences in some instances. There is no doubt, moreover, that the surveyors and their Institution have been led to approve the draft specification largely because of this same approximate agreement between the classification based upon the observation of their members and that based upon minimum illumination readings. I should, therefore, like to point out the radical unsoundness of the argument, and to ask the surveyors to give careful consideration to the matter.

If the lighting of the streets which the surveyors inspected had been planned and carried out by contractors working to the specification as drafted, then it might well have been urged (though it would still not have been true) that lighting of a certain grade of value would always be produced in a street if a certain minimum horizontal illumination were specified. But that was not the case; and that is where the radical fallacy of the argument lies.

The lighting of the streets surveyed was designed and carried out on the usual plan of deciding, by experience and by experiment, what number of lamps of a certain description, placed on columns of a certain height, would give the kind of illumination that was desired or could be afforded in those streets.

Those lamps, on those posts, at certain distances apart, produced the illumination of the streets which the surveyors classified as A, B, C, or D, according to their impression of the illumination on inspecting the streets. But that effect, that optical impression, was produced by—what? By the following factors, in combination:

The apparent brightness of the lamps.
The height of the lamps above the street.
The distance of the lamps apart.
The maximum illumination in the street.
The gradation of maximum down to minimum illumination in the street.
The minimum illumination in the street.

All these factors, *not the last one only*, go to make up the good, bad, or indifferent lighting of a street.

If in two streets you have about the same number of lamps, of similar power, on columns of similar height, you will get about the same maximum, average, and minimum horizontal illumination. By a different number of lamps, of different power, on columns of different height, you can get *the same minimum horizontal illumination, but a different maximum, and a different average illumination*—a differently lighted street altogether, and such as no surveyor would class with the others.

Is it not then obviously illogical to say that, to ensure that a street shall be lighted up to a certain standard, it is only necessary to specify the minimum illumination the contractor is to give—leaving it to him to give what maximum and average illumination he chooses?

I am quite sure that Mr. Trotter (and the surveyors) will, on further consideration of the matter, agree that minimum horizontal illumination is not an adequate basis for either a specification or a contract.

F. W. GOODENOUGH.

Gaslight and Coke Company's Offices,
April 30, 1913.

Testing of Refractory Materials.

SIR,—I believe that it is generally acknowledged that the Refractory Materials Committee of the Institution of Gas Engineers have done an amount of very useful and valuable work in endeavouring to standardize the various kinds of refractory materials used in gas-works; and they have also laid down special rules for the testing of same, which rules I consider are of the greatest importance in connection with the gas industry generally. But these rules, if they are to be of any real value and practical utility, must be universally accepted and adopted both by manufacturers and those analysts who test and analyze all refractory materials used in gas-works.

I believe that I can speak for the majority of the manufacturers who have been pleased to work with the Committee, and who have accepted their prescribed mode of testing, which system of testing is also being carried out by eminent authorities like Messrs. Mellor, Colman, Lessing, and others. But my object in writing this letter is to especially point out that there are some analysts who have not fallen into line—who test with secret methods and fads of their own, and which tests are very objectionable and misleading. As proof of this I will explain what has recently come under my immediate and personal observation.

A gentleman offered to sell to a company with which I am connected some silica fire materials, and he presented a test and said that the material had been made into bricks, and that they withstood a temperature of 3632° Fahr. I at once questioned and criticized this statement, and asked if the bricks had been tested by the standard method and compared against Seger cones of new series. He afterwards reported to me that the analyst had written confirming his statement by saying that they had been tested and compared against Seger cones.

In the meantime our chemist tested the material, and found that the test came out similar to other material in the surrounding district, which confirmed me in my contention that the bricks had been given a fictitious value, and after finally pressing the gentleman he told me that he held the certificate of a London public analyst of considerable experience as to the statements that he had made to me. I thought that inasmuch as the results had come from a public analyst I was quite

justified asking how he had made the experiments; and the analyst's reply was that it was a secret method of his own, which he would not disclose to anybody. Upon this I asked the gentleman to make a few more bricks similar to the former ones, and when he had done so we broke a brick in half and he sent one half to the analyst and I sent the other half to Dr. Mellor. I herewith append the extraordinary difference between these two analysts:—

Half-brick tested by analyst by private method . . 3632° Fahr.
Half-brick tested by Dr. Mellor by standard method . 3038° ,,

So the question now arises where are we in this matter?

I may say that this is not the only case that has come within my knowledge of analysts giving a fictitious value to refractory materials when compared with Dr. Mellor's test; and I consider that for the benefit of the profession generally it is quite time that such extraordinary testing is put a stop to. I would suggest to the Committee that they schedule the names of analysts who will undertake to abide by the Committee's standard of testing; and I also strongly advise all engineers and manufacturers to have their refractory materials tested only by those who are acknowledged by the gas profession generally.

For many years I have made a practice of testing all fire materials used in works under my direction; and in cases where I wanted my test confirmed, I have for years past sent them to Dr. Mellor, of the Potteries, who I know is most experienced and a thoroughly practical tester of refractory materials, and his method of testing, I believe, has been adopted. It is absolutely necessary if we are to have reliable tests of any value that the tests should all be made on the same basis and under standard conditions, and so dispense with all secret methods and fads.

I should not have paid for these tests being made for my own satisfaction, as I know sufficient of the subject to take care of myself. I have had them made so as to let the gas profession know what irregularities are taking place; and I leave it with you and the profession to express their opinion on the matter, with a view, I hope, of seeing if they cannot devise some means of bringing about universal uniformity in place of the chaos which exists at the present time, as shown by the certificates I enclose for your perusal.

Manchester, April 30, 1913. JOHN WEST.

Gas v. Electricity for Cooking Purposes.

SIR,—We must all be conscious of a debt of gratitude owing to Miss Edden and Miss Padley for their debate on this subject, reported on p. 43 of your issue of April 1.

The several very able observations made should fulfil no mean part in contributing towards, if not a solution, at least a simplication, of the issues, and do a great deal to help in the establishment of an impartial judgment on a matter which the lapse of time promises to make even more important than it is now. It seems to us that these issues will always be invested with a certain amount of indefiniteness, because so much depends upon the merely human element evinced in *management*. But any discussion, such as that held between Miss Edden and Miss Padley, which will help to make tangled paths clear, is to be heartily welcomed.

Miss Padley succeeds in enlisting our admiration for the way in which she handled her subject, and certainly not least for the reluctance she showed to comment upon that worrying consideration of cost. It is our present purpose, however, to confine our remarks to the three chief points which Miss Padley takes for discussion—viz., purity, convenience, and safety.

In dealing with the first point, Miss Padley promotes the inference that contamination of the food by burnt gas is possible. If this is the view to which she gave utterance, we beg leave to say that, in the realm of science, it has no foundation in fact. It will be known to you, Sir, that the products of burnt gas are not of a nature capable of injuriously affecting meat when in contact with them in a properly-constructed modern gas-oven; and the robust health enjoyed by many cooks will disprove any insinuations about the bad effects of gas upon that most necessary matter—health.

Miss Padley refers also to "noxious fumes." She does not make her statement clear; and we should greatly value detailed particulars from Miss Padley, defining the harmful properties of the products of combustion of town gas—so misleadingly referred to as "noxious fumes."

With the attribute of convenience, Miss Padley should have coupled that of durability, and the penalties paid when it is lacking. The absolute impossibility of the nickel-plated sheet-metal construction is clearly instanced by the very distinct tendency on the part of makers of electrical cookers to revert to recognized gas-cooker practice.

Miss Padley paints an attractive picture of the electrical cooker being scrubbed at the sink; and well may she do so, for it is only in such pictures that this will be regularly done! If it were done in actual practice, we should like to know for how long the stove would be capable of carrying on its designed duties. If, as we are led to presume, Miss Padley would have more attention paid to the outside cleanliness of a cooker, what has she to say about the appearance and cleanliness of gas cookers with enamelled exteriors.

The next consideration is that of safety. Here Miss Padley is not, to our mind, in any way wise in her claims on behalf of electricity as being an agent free from dangers. We are led to remember the cause of several large and fairly recent conflagrations—notably, at Messrs. Arding and Hobbs' premises at Clapham; and we should think that not a few householders have at some time or other experienced the inconvenience caused by failure due to want of control over the electric current supplied. It is an agent ten thousand times more evasive than any gaseous fuel. This is further evidenced by the lack of fully graduated regulation of the rate at which heat is generated by the various heating elements in the modern electric cooker.

It would be more than interesting to hear something further about what Miss Padley defines as the "uncontrollable and elusive qualities of a gaseous fluid," as represented by ordinary town gas.

Our experience of shrinkages is substantially as Miss Edden stated; and it is noteworthy that Miss Padley's remarks, carefully read, confirm in substance all that Miss Edden has claimed for the gas cooker. But the issue at stake is—and it must be clearly borne in mind—that joints of meat are not by any means all that have to be cooked. In boiling and grilling operations, for instance, we do not think that even Miss Padley would claim for the "Tricity," or any other electrical cooker, as much as equality with the gas-stove. Again, the gas-stove is not used only for cooking. Hot water for many purposes, in large quantities and quickly, is frequently required; and in this field, the use of electricity, on all counts, is vastly inferior to gas as the heating medium.

Reviewing the comparisons that Miss Padley has advanced, we cannot but be impressed by the delightful assurance with which she conjures up evils when considering the gas-stove, and which, in a similarly happy vein, she is able to dispel when speaking of her favourite electrical cooker. However satisfying a method this may be to Miss Padley it is of course neither logic nor science.

It must never be forgotten that gas and electricity are only media for generating heat, and that one unit of electricity at 1d. generates 3400 units of heat, whereas, 33 cubic feet of gas, purchased for the same sum, give at least 16,500 units, or 5 units from gas for every unit from electricity. This is an uncompromising fact, which cannot be gainsaid, particularly when dealing with any boiling or liquid-heating operations.

We share your belief, Sir, that it was a disadvantage to the meeting that Miss Edden was not invited to reply to the observations made by Miss Padley, as it is not improbable she could then have cleared up many of the points which were still left at issue.

It will now be for your readers to await Miss Padley's response, which will doubtless be received with much pleasure and interest.

DAVIS GAS-STOVE CO., LTD.

59, *Queen Victoria Street, E.C., April* 30, 1913.

Size of Pennies and Slot-Meters.

SIR,—At a recent meeting of the Special Purposes Section of the North of England Gas Managers' Association, reference was made to the difficulties experienced with slot-meters in consequence of some modification in the size of pennies recently issued; and I was instructed to communicate on the subject with the officials of the Royal Mint.

When the correspondence was reported at the last meeting of the Section, it was considered to be of sufficient general interest to warrant its publication in the Technical Press. I enclose copy of the correspondence herewith, and should be obliged if you could find space for it in your next issue.

Hexham, May 2, 1913. HERBERT LEES, Hon. Secretary.

[ENCLOSURES.]

The Deputy Master of the Mint.

Sir,—The members of this Association have had under their consideration the difficulties which have arisen in connection with penny-in-the-slot gas-meters as a result of some change in the size of new pennies recently issued. Some gas undertakings have been put to great expense in sending men to release coins which have stuck fast owing to the new pennies being too large for the mechanism.

I am directed to respectfully ask if any steps have been, or will be, taken to revert to the former size of coin. Having regard to the hundreds of thousands of these meters in use, it will become a very serious matter indeed if the new coinage should continue to be made of larger size than the old, for which the mechanism was originally made.

I should be obliged, therefore, if you could give me any assurance on this subject to place before the members at their next meeting.

Hexham, April 9, 1913. (Signed) HERBERT LEES, Hon. Secretary.

Herbert Lees, Esq.,
North of England Gas Managers' Association.

Sir,—With reference to your letter of the 9th inst., I am directed by the Master of the Mint to inform you that no change has recently been made, nor is it proposed to make any change, either in the diameter or thickness of the pennies issued from the Mint, which should not exceed 1·225 inches in diameter and 0·08 inch in thickness.

It would appear, however, from representations which have been recently addressed to the Master of the Mint, that in a few exceptional cases these limits have been exceeded—a circumstance which he very much regrets. It is not now possible to ascertain when, and under what circumstances, these exceptional cases occurred. But the Master of the Mint realizes the inconvenience to which they give rise, especially where pennies are used in connection with automatic machines; and every effort will be made to prevent their recurrence.

I am to add that, as the result of personal communications which have taken place between the officers of the Mint and two large firms of gas-meter manufacturers, the Master of the Mint has reason to believe that in some instances a slight modification of the machine would very much reduce the possibility of its failure; and he would be glad at any time to afford any assistance in his power to other manufacturers, if they would send a representative to the Mint competent to afford the necessary technical explanations.

(Signed) S. MATTHEWS, Chief Clerk.

Royal Mint, London, E., April 22, 1913.

Intermittent Vertical Retorts in America.

SIR,—I have read with a great deal of interest your comment on the paper of Mr. R. B. Brown, of Milwaukee, Wisconsin, which appeared in the issue of the "JOURNAL" for the 1st of April. In response to your inquiry as to whether Mr. Brown has therein properly represented the best experience in America with the intermittent type of vertical retorts, I respectfully answer in the negative.

As you are probably aware, there is but one installation of a commercially successful type of intermittent retort in operation in this country at this time, and, whereas we will admit for the moment that its operating results were not such as to astound the American gas

industry, it must be conceded, by every fair-minded engineer, that the installation to which I have referred was, in every sense of the word, a decided success.

I am inclined to believe, from a careful study of Mr. Brown's reference to the intermittent verticals, that his statements are not founded upon an intimate knowledge of the situation. He admits that some of his conclusions are drawn from hearsay and some from observation.

It is a well-known fact that, at times in the daily operation of a large plant, more especially a gas-works, some apparently quite insignificant detail does not perform its proper function, and, as a result, the general equilibrium of the plant is temporarily deranged. It is quite possible that, when Mr. Brown saw or heard evidence of considerable leakage and other defects, such conditions were caused by a temporary derangement in the hydraulic mains, due to difficulties in the exhausting plant, which possibly were caused by delinquent operators in not properly removing the accumulated deposits of tar and coke dust from mouthpiece frames.

Similarly, the "hanging" of the charges to which Mr. Brown refers was, in all probability, attributable to an excessive accumulation of carbon in the interior retort, thus preventing the ready discharge of the coke; or the same may have been due to a temporarily improper regulation and intensity of heats. I cannot agree with Mr. Brown in the statement that the swelling of the charge has no material effect upon its hanging in the retort, provided that neither of the aforesaid causes has contributed to this condition. It is conceded that some of the conditions which I have very briefly set forth above have occurred, and will necessarily occur, at times; but the statement that these conditions occur frequently must be repudiated.

As already stated, we have but one installation of intermittent verticals in practical successful operation in this country, and for this reason, do not consider a comparison of this system with other methods of coal carbonization, of which we have innumerable examples, each perhaps carbonizing various qualities of coal, reasonable and fair to the intermittent vertical.

It appears to me that Mr. Brown has unjustly criticized the verticals; and I am convinced that his criticism is entirely due to absence of thorough familiarity with every-day operating details and results.

Notwithstanding the unfavourable views which Mr. Brown has expressed in his paper respecting the verticals, it appears that present and future developments of the coal-carbonizing industry of America will incline very perceptibly towards vertical retorts, of either the intermittent or the continuous system. Doubtless the developments in this direction during the next two or three years will entirely substantiate this statement.

GEO. A. BOLZ,
Manager, Didier-March Company.

Perth Amboy (N.J.), April 23, 1913.

Mr. Orme's Paper on Gas-Burners.

SIR,—Apropos of your remarks on my Eastern Counties Association paper on "Burners," I thank you for same. The central effort of the paper is well expressed thereby.

With regard to self-lighting mantles, your expression hardly does you justice. If for (say) 1s., you can have before you, in daily evidence, the beautiful phenomenon of "occlusive incandescence" (even if it only lasts effectively for one or two months), I am sure you will be tempted to do so, and think the money well spent. When the mantle fails in its spontaneous action, you will then, if indisposed to cast it off, be able to extract the fullest use from it by giving it "the initial start in the ordinary way."

I am sure, Sir, that you, and the gas industry generally, are sufficiently interested in this matter to investigate. My own experience with the mantles is gradually giving me ideas for their improvement; and I feel convinced that more universal interest in them will lead to the production of a perfected article, the utility of which will appeal to every reader of the "JOURNAL."

The mantles I have used were bought from the Provincial Incandescent Fittings Company, of Manchester. As I am receiving requests for this information, your publication of this fact will serve a useful purpose. I do not know where else they can be procured.

Woodbridge, May 1, 1913.

WM. ORME.

The "Wandering Tinker."

SIR,—The answer (save the mark!) of "Anon" to my letter of the 16th inst., is about as pure a specimen of rigmarole, not to mention ungrammatical construction, as may be found in a year's reading.

There was no quibble in my brief note setting the speaker right as to the authorship of his quotation. It is "Anon's" reply that is quibbling.

When a speaker (or writer) misnames the source of what he quotes, it is surely justifiable in a hearer (or reader) to set him right.

"Anon" asks: "Who with a love for sweet and telling speech would inflict upon his hearers the source of all we (*sic*) say?" No need to do so. But if he "inflicts upon his hearers" the *wrong* source, what then? Sterne, although he did borrow (and filch) a good deal, is in no need of the stolen leaf that "Anon" would add to his laurel crown.

VERO.

April 30, 1913.

Lighting of Edinburgh Streets.

Under date of the 28th ult., the Wholesale Fittings Company, Limited, write: "In the notice with regard to the presentation to Mr. G. D. Mackay, which appeared in your last issue, we perceive that you refer to the lighting of the streets of Edinburgh. We in no way decry the admirable device of Mr. Wilson; but we would desire to point out that in the lighting of the main streets of that city the "Star" inverted burner is the speciality used. It has now been for many years used for this purpose by the street lighting authorities, and was adopted after a series of exhaustive tests to which it was subjected by Mr. Mackay. Prior to its use, it was placed in competition with all the burners of its day."

REGISTER OF PATENTS.

Incandescent Lighting Plants.

DALÉN, G., of Stockholm.

No. 7393; March 26, 1912. Convention date, April 13, 1911.

The patentee points out that, owing to the richness in carbon of certain gaseous compounds of carbon (such as acetylene), the sectional area of the gas-nozzles of incandescent gas-burners, where used, needs to be very small; and they are liable to be obstructed, "so that the burners are unreliable in use."

To avoid this inconvenience it is arranged to feed more than one incandescent lamp with a mixture of gas and air from a common gas outlet nozzle. But as the opening of this nozzle has consequently to transmit a correspondingly greater quantity of gas, it is made of relatively large dimensions so as not to be liable to become choked. As, however, the incandescent lamps are fed directly with gas and air from the common nozzle, they are so far dependent on one another that they must all burn simultaneously, as it is hardly possible to adjust automatically the gas that flows through the common nozzle according to a varying number of burning lamps. This circumstance is not an inconvenience in certain cases; but when it is necessary to vary the number of lamps burning simultaneously, the gas outlet nozzle is, according to the present invention, combined with a storer or receiver from which a conduit extends to the lamps in such a way that the gas supply to the nozzle is automatically opened and closed. Thus the pressure in the receiver is maintained constant in spite of the varying consumption of the gas and air contained in it.

Gas Analysis Apparatus.

HARGER, J., of Gateacre, near Liverpool.

No. 9623; April 23, 1912.

This gas analysis apparatus is of the type in which the volume is kept constant and the amount of gas absorbed by any given reagent is determined by the change in pressure of the gas.

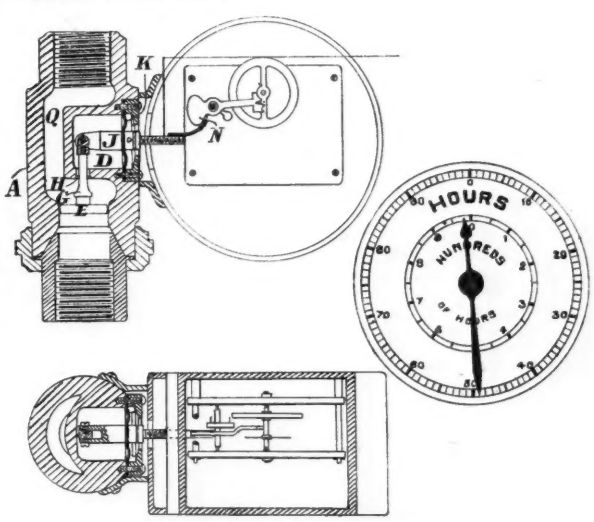
The patentee points out that it has been proposed to use apparatus of this type in which the lower part of the gas chamber is formed as a reagent container, and is normally separated from the gas chamber proper by a valve member which can be raised when it is desired to absorb one of the constituents of the gas. But his arrangement is designed to enable the gas to be treated not only with a single reagent, but also, where desired, by a succession of reagents. For this purpose, it is necessary to add the reagents to the gas chamber in such a way that none of the gas is trapped in one or other of the reagent chambers; otherwise the gas is not completely acted on by the reagents subsequently added. For this purpose the reagents are either admitted to the chamber in the form of capsules, or from side tubes attached to the apparatus, from which the gas can be displaced after absorption by running the reagent back into the side tube again. Similarly it is important that there should be no pockets in the pressure-recording device in which gas may escape the action of the reagents. For this purpose, it is said to be preferable to abandon the ordinary pressure-gauge and to use an aneroid.

Time Recorder for Gas Lamps, Stoves, &c.

THORP, T., F. T., and H. T., of Whitefield, near Manchester.

No. 14,287; June 19, 1912.

This invention relates to high-pressure and other gas lighting and heating apparatus; and its object is to record the time during which the gas has been consumed.



Thorp's Time Recorder for Lamps, Stoves, &c.

In carrying the invention into effect (as shown), the tubular chamber A is fixed vertically by screwing directly to the main. In the lower part of A is a metal disc E slightly smaller than the cylindrical portion of A in which it moves. This cylindrical orifice is parallel for a short distance, as a decided and quick rising of the disc is desirable to ensure the starting of the clock. To the disc is attached a rod carrying a small

cone G. The upper end of a rod (formed as a hinge) is connected at right angles with a lever J, at about the centre of which is fitted a diaphragm K, held down and made gas-tight by a ring. The part of the tubular portion A which forms the chamber D only communicates with the other part of A by a small aperture H; and in case of damage to the diaphragm, the flow of gas to the atmosphere is only through this aperture, which is almost closed by the rod, and is entirely closed when the cone G comes in contact with its seating H. To A is attached a timepiece P, having preferably a lever movement and actuated in the usual way.

This timepiece (made to show hours or other units) is fitted to the part A so that the back of the crutch N of the escapement is about level with the end of the lever J when the disc E is at its lowest point. When no gas is passing, the end presses against the underside of the crutch to such an extent that, when the gas is turned on and passes to the lamps and the end of the lever moves away from the crutch, there is a sufficient reserve of power due to the tension of the hair spring to start the escapement working.

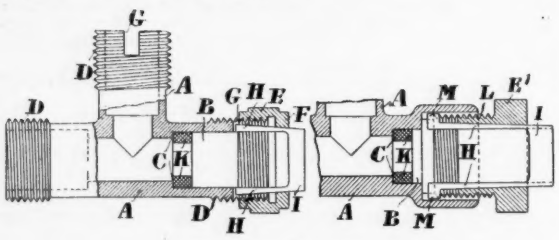
The flow of the gas when the apparatus is in action lifts the disc E, which in turn actuates the lever J, and the gas passes freely to the lamps, stoves, &c., by means of the passage Q.

Pipe-Joints.

MEYENBÖRG, A., of Hagen, Westphalia.

No. 21,748; Sept. 24, 1912.

To connect a threadless pipe to a socket by means of a split cone, the patentee proposes that the cone should be cut at the thick end so as to form longitudinal wedge-shaped arms, which are guided in slots or grooves made in the socket, so as to be prevented from following the rotary movement of the tightening nut.



Meyenborg's Pipe Joints.

The invention is illustrated (in alternative constructions) in connection with a T-socket. Each end of the socket A is bored out so as to accommodate the end of a pipe in a space B; a shoulder C being formed, between which and the butt end of the pipe packing K is arranged.

According to the first sketch each socket end has an external screw-thread D for the reception of a nut E, provided with a flange F adapted to bear against the wedge-shaped arms H of a ring I. The ring is arranged on the pipe, and its arms are adapted to be clamped to it when the nut is screwed on to the socket end; the pipe being simultaneously pressed against the packing so that a tight and rigid joint is obtained. Slots G are made in the socket for receiving and guiding the arms H, which are thereby secured, together with the pipe, against other than axial movement.

In the second construction the socket is provided with an internal screw-thread for the reception of a sleeve L holding at one end a nut E^1. The sleeve bears against the arms H of the ring I so as to clamp it to the pipe as previously described. The bore of the sleeve L is conical, so as to conform with the wedge-shape of the arms H. Lugs M, formed at the free ends of the arms, take into longitudinal grooves made in the interior of the socket, thereby preventing the ring I and the pipe from rotary movement.

Purifying, Cooling, and Washing Gases.

THEISEN, H. E., of Munich, Germany.

No. 1382; Jan. 17, 1913.

This invention relates to a further development of the apparatus for purifying, cooling, and washing gases, described in patent No. 22,433 of 1910. It relates to the construction of the disintegrator-like apparatus (consisting of rotating or partly rotating and partly stationary perforated cylindrical and conical members), which it is now proposed shall be formed of angle irons stiffened by flat iron rings, so far as the rotary cylinders are concerned, and of round, rectangular, or the like bars, for the stationary cylinders, which are now to be formed of stamped boiler plates.

Valves for Gas-Burners.

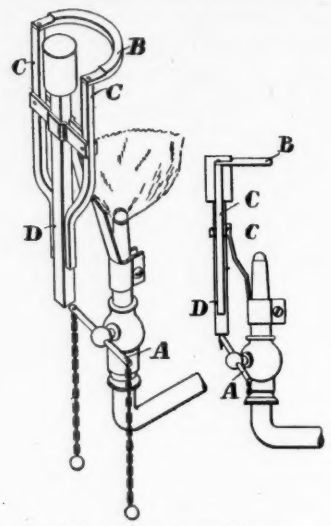
YATES, F. E., of Minneapolis, U.S.A.

No. 24,790; Oct. 29, 1912. Convention date, Jan. 15, 1912.

The principal object of this invention is to provide means whereby, when the gas flame is extinguished, the flow of gas to the burner will be cut off automatically, by means of "a sliding valve operator held out of normal position by heat-actuated means so constructed as to grip the operator as long as the gas is burning."

A perspective view of the device applied to a gas-burner, also a side elevation, are shown.

The burner is lighted after the valve rod A has been lifted, and held until the yoke B has been sufficiently heated to expand. The curved ends of the arms C thereupon move to grasp the sliding member D, the arms having a pivotal connection with the transverse bars which allow the yoke to force it in contact with the sliding bar. Thus, as long as the yoke is maintained in its expanded position, the sliding valve operator will be held raised—the valve remaining open. To close the valve, the rod A is manipulated and the sliding valve operator is



Yates's Gas-Burner Valve.

allowed to fall. Should the flame be extinguished without the valve being closed, the cooling and contraction of the yoke separates the lower terminals of the arms C, permitting the weighted rod D to fall, which will, through the medium of the rod A, close the valve and cut off the supply of gas.

Manufacture of Ammonium Sulphate.

VIS, G. N., of Cuise, Lamotte, France.

No. 2002; Jan. 24, 1913.

This invention relates to a modification of the process for manufacturing ammonium sulphate described in patent No. 9609 of 1911. It consists in passing gaseous ammonia and carbonic acid in equivalent quantities to form carbonate into a saturated solution of ammonium sulphate and treating the ammonium carbonate thus formed by means of calcium sulphate, so as to form ammonium sulphate, which is then brought into solution by a raising of the temperature and separated from the calcium carbonate—the mother-liquor obtained after separation of the ammonium sulphate being used over again to be treated with ammonia, carbonic acid, and gypsum.

APPLICATIONS FOR LETTERS PATENT.

9308.—HOCKINGS, A., "Water-supply system." April 21.
9334.—NOAD, H. C. C., "Switch manipulating mechanism for gas lighting." April 21.
9335.—OGLESBY, S. W., and AYTON, F. R., "Mantle boxes." April 21.
9357.—PICTET, R. P., "Separation of gaseous mixtures into their constituents." April 21.
9375.—MOELLER, J., and WOLTERECK, H. C., "Manufacture of coke." April 21.
9379.—SHAW, E. J., "Gas-lamps." April 21.
9380.—PATERRA, A., "Gas-regulators." April 21.
9397.—THOMAS, J., "Incandescent burners." April 22.
9400.—TOOGOOD, H. J., and DEMPSTER, R., AND SONS, LTD., "Continuous carbonization of coal in vertical retorts." April 22.
9454.—CHURCHILL-SHANN, M. H., "Gas-turbines." April 22.
9499.—WADE, H., "Manufacture of ammonia and other bye-products in gas-generators." A communication from the "Montania" Brennstoffverwertung G.m.b.H. April 22.
9508.—REIF, N., "Gas-igniting." April 22.
9514.—COX, F. W., "Globe or shade." April 23.
9577.—SARTORI, G., "Indicating devices for measuring apparatus." April 23.
9605.—HILLS, W. F., "Chimney-caps for burners." April 23.
9640.—JACKSON, T., and RAMSAY, A., "Gas-flashing apparatus." April 24.
9664.—HIBBERD, C. E., and GOAD, F. L., "Gas-meter." April 24.
9700.—KONIG, W., "Locking cocks." April 24.
9717-8.—HARPER, J., AND CO., LTD., and RETALLACK, C., "Gas-stoves or radiators." April 25.
9742.—KIRKE, P. ST. G., and BONECOURT SURFACE COMBUSTION, LTD., "Combustion of combustible mixtures." April 25.
9743.—M'COURT, C. D., and BONECOURT SURFACE COMBUSTION, LTD., "Combustion of combustible mixtures." April 25.
9789.—AKT.-GES. FÜR SELAS BELEUCHTUNG, "Pressure-regulator." April 25.
9825.—MOORE, A. B, "Lighting burners." April 26.
9837.—ANNEAR, R. W., "Pipe-joints." April 26.
9862.—MILLAN, A. F., "Mantles." April 26.

Owing, it is stated, to the fusing of an electric cable, the works of Messrs. Hayes, Reynolds, and Co. at Letchworth Garden City were destroyed last Friday morning by fire; the loss being estimated at £40,000. The outbreak occurred in the calico printing drying-room; and the entire building was gutted within half an hour.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bills brought from the Commons and read the first time : Herne Bay Gas and Electricity Bill, Swanage Urban District Water Bill, Titchfield District Gas Bill.

Bill read a second time and committed : Harrow and Stanmore Gas Bill.

Bills reported : Grays and Tilbury Gas Bill, Llantrisant Gas Bill, Porthcawl and District Gas and Electricity Bill, West Hampshire Water Bill.

Bill read the third time and passed : Redcar, Coatham, Marske, and Saltburn Gas Bill.

The Gas Orders Confirmation Bill, to confirm Provisional Orders made by the Board of Trade in regard to Kibworth, Midsomer Norton, Redditch, and West Staffordshire, was presented last Tuesday, and read the first time.

The Gas and Water Orders Confirmation Bill, to confirm Provisional Orders relating to Bagnalstown and Dronfield Gas and Alresford and Portsmouth Water, was also presented and read the first time.

The Ebbw Vale Water Bill has been referred to a Select Committee, consisting of the Earl of Kintore (Chairman), the Earl of Verulam, Lord Camoys, Lord Wynford, and Lord Monkswell, which commenced sitting last Thursday.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bill brought from the Lords, and read the first time : Redcar, Coatham, Marske, and Saltburn Gas Bill.

Bills reported : Bishop's Waltham Water Bill, Mid Kent and East Kent District Water Bill, Westgate and Birchington Gas and Electricity Bill.

Bill read the third time and passed : Mynyddislwyn Urban District Council Bill.

The Local Government Provisional Order (Gas) Bill, to confirm a Provisional Order relating to Biddulph, was presented last Wednesday, and read the first time.

The Gas and Water Provisional Orders Bill (No. 2), to confirm Provisional Orders made by the Board of Trade in regard to Faversham, Hawkhurst, Peniston, Thurlstone, and Oxspring Gas and Wey Valley Water, was presented last Friday, and read the first time.

The Silloth Gas Bill, to empower the Holme Cultram Urban District Council to purchase certain gas-works of the North British Railway Company and supply gas within the urban district, was also presented on Friday, and read the first time.

A Smoke Abatement Bill.

On Wednesday, Mr. A. G. C. Harvey (Rochdale) asked leave to introduce a Bill to make provision for fireplaces and furnaces, other than the domestic hearth, consuming their own smoke. As a manufacturer, he was convinced, after experience and experiment, that by the introduction of scientific appliances black smoke could be abolished —in most cases to the profit of the manufacturer. Under the Bill, the emission of black or other smoke in quantities such as to be a nuisance would be punished by fines levied in an ascending scale. Joint Boards would be created on the plan of the River Boards. They would be composed of representatives of local authorities grouped together under a scheme of the Local Government Board, and they would administer the Act with the aid of qualified inspectors. Leave to introduce the Bill was given, and it was read the first time.

TOTTENHAM AND EDMONTON GAS BILL.

The Electric Supply Company Refused Locus Standi.

Before the Court of Referees last Thursday, the North Metropolitan Electric Power Supply Company applied for *locus* against the Tottenham and Edmonton Gaslight and Coke Company's Bill. The object of the Bill is to transfer the undertaking of the Enfield Gas Company to the Tottenham Company, and also to transfer the Order of 1902 of the District Council of Wood Green, dealing with powers to supply electricity.

Mr. C. C. HUTCHINSON, K.C., appeared for the North Metropolitan Electric Power Supply Company ; and Mr. HONORATUS LLOYD, K.C., represented the Tottenham Gas Company.

Mr. HUTCHINSON said he asked for *locus* under Standing Order No. 129, on the ground of competition. The Bill, in Part V., sought power to transfer to, and vest in, the Tottenham and Edmonton Gas Company the Electricity Order of 1902 which was granted to the District Council of Wood Green. The Gas Company also sought general powers that they might, by agreement, acquire from the local authority a Provisional Order under the Electric Lighting Acts, 1882 and 1899. This related to any district or place wholly or partly within, or adjoining, the limits of supply of the Tottenham and Edmonton Company as a gas company. The North Metropolitan Electric Power Supply Company were incorporated in 1909, and had powers to supply in bulk to authorized distributors, to supply for purposes of haulage or traction, to supply for power and for lighting purposes. There was further power for the Company to supply electrical energy for all purposes to the Alexandra Palace and to Wood Green. The power to supply electrical energy for all purposes to the Alexandra Palace and Wood Green was given by section 7 of the 1905 Act of the Electric Supply Company. The position of the Electric Company with regard to Wood Green was that they might supply for power purposes only within Wood Green by the consent of the Council, which consent was not to be unreasonably withheld ; and in the case of the consent being withheld, the question should be determined by the Board of Trade. Under section 7 of the 1905 Act, they had also absolute and unrestricted power to supply to the Alexandra Palace without consent. In section 18 of the Act of 1905, the Electric Company might, by agreement, but not otherwise, acquire from any local authority or any undertakers Provisional Orders under the Electric Lighting Acts relating to districts within the Company's area of supply. Negotiations were commenced some few years ago with the Wood Green Council with regard to a supply of electricity ; and although no supply had been actually given, the negotiations were not yet terminated. There had, however, been no supply given to the Alexandra Palace by the North Metropolitan Electric Power Supply Company. The Gas Company supplied gas to people in Wood Green for private electricity generating plants. At present, the Gas Company only had powers to apply for Provisional Electric Lighting Orders ; and anyone who was affected by any such application would have the right to appear in Parliament and oppose the Order if it changed their position. The position of the Electric Company was changed by the proposal in the Bill ; and it was for this reason that they asked for *locus standi* to oppose the Gas Company's Bill.

The CHAIRMAN said that competition usually meant somebody else coming in where one person was established ; but Mr. Hutchinson wished the Court to read the Standing Order as meaning that somebody else ought not to come in, although the Electric Company were not supplying.

Mr. HUTCHINSON said that he was authorized to supply for purposes of power in Wood Green, and the Gas Company's Bill would enable them to compete with the Electric Company in respect of the power supplies that the latter were authorized to give, and in one or two cases were actually giving. Surely this entitled him to *locus standi* to be heard against them. In clause 42 of the Bill, the Gas Company were seeking to obtain powers which would enable them to take transfers of electrical undertakings ; and this again would affect the position of the Power Company, who already had similar powers.

The CHAIRMAN, without calling on Counsel for the Gas Company to reply, disallowed the *locus*.

WESTGATE & BIRCHINGTON GAS AND ELECTRICITY BILL

The Unopposed Bills Committee of the House of Commons presided over by Mr. J. WHITLEY, the Chairman of Ways and Means, sent this Bill forward for third reading last Thursday. Its purpose is to extend the gas limits, and to give the Company powers to supply electricity. Among the clauses in the Bill is one giving the Company authority to claim for the cost of disconnection of supply in the case of a consumer failing to pay his account, and also to claim for the reconnection, should the consumer desire to come on to the mains again. The clause further gives the Company power to cut off the supply at the meter in the case of a consumer failing to pay his account. This clause has been inserted in the Bill in view of a Bristol County Court decision, which held that a consumer can compel a Company to cut off the supply in the street.

PROTECTION OF MAINS DURING TUNNELLING.

A Select Committee of the House of Lords presided over by Lord SANDERSON concluded last Tuesday their consideration of two Railway Bills referred to them ; one being the City and South London Railway Bill. Petitions against the Bill had been presented by the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Metropolitan Water Board. On the question of construction in the enlargement of the tunnels, there was considerable discussion on the previous day on the subject of pumping.

Mr. LYNDEN MACASSEY, K.C., on behalf of the Metropolitan Water Board and the Gaslight and Coke Company, said these two authorities had agreed a joint liability clause which would enable either or both parties to take joint proceedings before an arbitrator against the Company if any damage were caused to their mains by the operations of enlarging the tunnels of the Railway Company, which was the scheme of the Bill ; and he asked the Committee to insert the clause.

Mr. HONORATUS LLOYD, K.C., for the promoters, objected to the clause, and said that the insertion of it would make it appear that gas and water mains were superior to anybody else's property, inasmuch as there was a general clause in the Bill giving certain rights to property owners in respect of damage to their property.

The CHAIRMAN, after consulting with the Committee, said that they saw no grounds for inserting the proposed clause.

Mr. MACASSEY then moved another amendment on behalf of the Metropolitan Water Board and the South Metropolitan Gas Company, to the effect that the enlargement of the tunnels should be carried out one at a time, in order to prevent subsidence of the water-mains through the pumping operations during the tunnelling works.

Mr. *J. W. Restler*, Deputy Chief Engineer of the Metropolitan Water Board, and Mr. *W. Doig Gibb*, the Chief Engineer of the South Metropolitan Gas Company, were called in support of the amendment.

Mr. *Hay*, on behalf of the City and South London Railway, said that there would be no danger from the tunnel enlarging works.

Mr. TYLDESLEY JONES, in cross-examination, made the point that while the shutting-down of one tunnel while it was being enlarged might result in some inconvenience to the public, this would be nothing compared with the inconvenience to the public through the stopping of the gas and water supplies consequent upon any subsidence and damage to the mains. Witness, however, replied that the operations of enlarging the tunnels would be carried out under compressed air ;

and thus the water would be kept back until the sides are completed. In this way, there could be no subsidence which would affect the mains.

The Committee refused to grant the special protection asked for.

WEST HAMPSHIRE WATER BILL.

HOUSE OF LORDS COMMITTEE.—Monday, April 28.

(*Before the Marquis of* BRISTOL, *Chairman, Lord* RAVENSWORTH, *Lord* MONTEAGLE, *Viscount* HOOD, *and Lord* PLUNKETT.)

The consideration of this Bill, the opening proceedings in which were reported in the "JOURNAL" last week (p. 340), was continued to-day.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. F. N. KEEN appeared for the promoters, the West Hampshire Water Company. The only opponents to the Bill were the Bournemouth Corporation, who were represented by Mr. VESEY KNOX, K.C., and Mr. G. W. BAILEY.

Mr. *Llewellyn*, the Manager of the Company, was briefly cross-examined by Mr. VESEY KNOX. The order for the new pressure filters was, he said, given two or three weeks ago. The roughing filters were still being used, there having been some misunderstanding between the Company's officers and the Corporation's experts who visited the works. These filters had not once been out of use. Counsel then endeavoured to show that witness had never had any experience of filtration methods in connection with river water before he came to Bournemouth. Mr. Llewellyn, however, claimed a good working knowledge from his previous experience at Neath. So far as some of the unsatisfactory analyses of the Company's water were concerned, witness was quite convinced that these were due to the samples being taken from hydrants; and he drew attention to reports upon the water of the Metropolitan Water Board in which it was said that bacillus *coli* was found in 10 c.c.; whereas in the West Hampshire water it was found in only 60 c.c.

Mr. *W. Tucker*, a member of the Christchurch Council and Director of the West Hampshire Water Company, spoke as to the discovery of the irregularities in the issue of the shares and the taking of Counsel's opinion with a view to putting the matter right. Nobody had suffered; and the object of the Bill was to give the shareholders a proper title to their securities. As to the history of the Company, he pointed out that although they could charge their consumers 7½ per cent. on the rateable value of their property, they only charged 5 per cent. Dealing with the efforts to improve the quality of the water, witness pointed out that negotiations for the purchase of the new pressure filters were entered into long before the enteric outbreak at Ringwood. The Board were strongly opposed to purchase by the Bournemouth Corporation, inasmuch as only 2½ per cent. had been paid on the shares, and the shareholders were entitled to back-dividends as the Company's prospects improved. Much had been made of the point that the Bournemouth Corporation had now come to Parliament as a last resource in order to obtain pure water; but, as a matter of fact, the Corporation had power, if they desired, to take the Company before the Justices, if they could prove that impure water was being supplied. This, however, had never been done.

In cross-examination, witness said it was the Company's desire to do everything to secure pure water; and they had been informed by the medical authorities of the districts above the Company's intake that there was no danger of pollution from crude sewage entering the river. Further questions were put to the effect that for two years past the Company's manager had been advising that the system of filtration was unsatisfactory, and yet the Company did not make any definite move. Mr. Vesey Knox suggested that the Company knew the Bournemouth Corporation were not anxious to publish the fact of a possibility of a contaminated water supply in the town, and that, in consequence, no serious steps were taken to remedy the state of affairs that existed. The ordering of the new filters during the past few weeks rather indicated that the Directors put off taking any action until they found the Corporation were determined to fight the matter before Parliament. During questions as to purchase, it was elicited that the Christchurch Corporation could only buy if the Company agreed. There was no arbitration clause in the Company's Act; and in spite of Counsel's attempt to show that, if the Bournemouth Corporation purchased, the Company would get full value for prospective profits and compulsory purchase, witness said he preferred not to sell. If any sale at all were to take place, he would prefer that the whole undertaking should go rather than the Bournemouth portion alone. Counsel's concluding question was that the Company would no doubt be quite willing to sell if they got a high price.

In answer to Lord PLUNKETT, it was stated that at present the Bournemouth Corporation do not own any water-works; the remainder of Bournemouth being supplied by another Company.

Mr. *G. Newman*, the Accountant to the Company, said that the Company had been unfortunate in their early stages, and certain irregularities occurred. In order to put the matter right, they treated everything as irregularities, and asked the Committee to put the whole position of the Company in order. In his opinion, however, some of the things which the Company feared were irregularities, were not irregularities.

In cross-examination on the small sums spent on repairs during the past four years, witness said that the amount did not matter, while the engineers reported that the works were in good condition.

Sir *William Plender* said that, having perused the accounts of the Company for the past ten years, he was of the opinion that the financial affairs of the Company had been properly managed.

Mr. VESEY KNOX suggested that the £3000 spent on unsuccessfully sinking wells should have been written off; but although witness thought this might be more prudent finance at the same time it was not unusual. As to reserve funds, the old East London Company had none. The policy was that while the undertaking was properly maintained that was all that was required. For the same reason, water companies did not set aside depreciation funds, although the West Hampshire Company had a depreciation fund of £697.

This concluded the case for the Bill.

Mr. VESEY KNOX then addressed the Committee on behalf of the Bournemouth Corporation, and dwelt upon the seriousness of the need for a Council of a health resort to have to come to Parliament and say that a portion of their district was supplied with an unsatisfactory water. As a matter of fact, the population supplied in Bournemouth by this Company was only 2000; but any suggestion of impure water would inevitably affect the whole of the town. The Corporation were not desirous of entering into municipal experiments; and while the Company did their duty, they were content to leave them alone. The sole desire of the Corporation was to get pure water for the inhabitants and to obtain complete security for the future. The Corporation, however, after ten years endeavouring to secure improvements, could not have confidence in the Company any longer. A Company who were capable of making careless and stupid financial blunders were equally capable of making blunders in the technical management of the undertaking; hence the serious prospects for the Bournemouth people. It was not part of his case that the Avon water was unfit to be used for drinking purposes; his complaint was, on the advice the Corporation had received, against the Company's methods of dealing with it. Counsel then dealt with the case of the Corporation already outlined in his cross-examination of the Company's witnesses; the main point being that sedimentation was the only remedy for what was claimed to be the present unsatisfactory position, against which constant complaints had been made by the Bournemouth Medical Officer of Health.

Tuesday, April 29.

On the resumption of the proceedings this morning,

Mr. VESEY KNOX continued his speech on behalf of the Bournemouth Corporation. He said that the position of things at Ringwood, from a sanitary point of view, were extremely unsatisfactory; and it had been quite a matter of luck that the health of Bournemouth had not been seriously affected by contamination of the water above the Company's intake on the Avon, through untreated sewage being allowed into the river. It was true that the Hampshire County Council had threatened to take proceedings against the Ringwood Council under the Rivers Pollution Act; but from experience of proceedings under this Act, he was not very much comforted by the proposal. In any event, the most that could be hoped for was that the Ringwood Council would put up a small plant for the treatment of their sewage; and the possibility of efficient management was not great from a Council who had acted as they had in the past. Again, no sewage works could be trusted to entirely eliminate the harmful bacteria; and, in addition, there must be the most perfect treatment of the water. On the Thames, for instance, all the places along the banks had sewage works, yet the Metropolitan Water Board did not think this relieved them from the obligation of treating the water according to the most elaborate modern methods. He dealt at some length with the necessity of storage in addition to sand filtration, and claimed that the introduction of pressure filters by the Company was merely to avoid the expense of adequate sand filtration. In any event, none of the substitutes proposed were practical remedies for storage. What was the Bournemouth Corporation's remedy? The Corporation felt that the only alternative was to get rid of the Company altogether by purchase; but they had no desire to go in for purchase if they could get from the Company some sort of undertaking that they would make arrangements for storage (which the Corporation were advised would make a vast difference to the purity of the water)—an undertaking, for instance, that the Company would provide storage, to the satisfaction of the Local Government Board, within three years. This would cause the Corporation to withdraw their opposition. Failing such an undertaking, he must ask the Committee to give the Corporation a purchase clause. If the Company did not want to sell the Bournemouth portion of their undertaking, the Corporation would be willing to come with a Bill next session to purchase the whole undertaking, and either hand it over to a Joint Board or to the Bournemouth Gas and Water Company, who were supplying the remainder of Bournemouth. In the alternative, he asked for a clause in the present Bill enabling the Corporation to purchase the Company from Bournemouth.

The CHAIRMAN drew attention to the previous offer of the promoters to come under a daily penalty of £10 if an impure supply were being given, and asked if it would meet the case of Bournemouth if purchase powers over the Bournemouth area were added to this clause, in the event of the penalty being enforced for a certain time.

Mr. VESEY KNOX replied that the difficulty was that now this matter had been raised the water would always be open to doubt; and the Corporation would rather be free of the Company now, and avoid a series of legal proceedings before they could purchase. It would meet the Corporation, however, if the Committee were to lay it down that the Company should provide storage for a certain number of days, and that if this were not done in three years, the Corporation should have the right of purchase.

Dr. *A. D. Edwards*, the Medical Officer of Health for Bournemouth, dealt with the complaints he had repeatedly made as to the Company's water, and expressed the opinion that storage was the only remedy.

Mr. BALFOUR BROWNE, in cross-examination, referred to witness's last annual report, in which it was stated that the water supply was good, and that the borough had been free from enteric. The reply was, first, that this report referred mainly to the supply from the Bournemouth Gas and Water Company, and, secondly, that he did not think it wise, in the interests of the borough, to publish the fact that one source of their water supply was liable to contamination. The publication of the present proceedings, he felt, would do the borough much harm. On the question of the Bournemouth Company's water, Counsel obtained the answer that bacillus *coli* had been found in 5 c.c.—a result as bad as any with the West Hampshire Company's water. But the particular sample, it was said, was taken from a tap where a bad result was to be expected. Finally, witness said he did not know that under the Company's Act of 1903, the Corporation had the right

to call in an arbitrator to determine the purity or otherwise of the water supplied.

Dr. *Lunn*, late Medical Officer of Health for Bournemouth, said there were many points of pollution on the River Avon, and it was essential to remove them as far as possible.

Mr. KEEN, in cross-examination, made the point that it was not the duty of the Water Company to police the river in order to prevent pollution, and they had no power to do so.

Mr. *W. Cash*, a Director of the Bournemouth Gas and Water Company, was next called. He said that his Company were prepared to take over the West Hampshire undertaking if the Committee thought fit to give the Bournemouth Corporation powers to purchase and then transfer.

In cross-examination, witness said that his Company had not double filtration; but they had storage, though he did not know for how long. Counsel suggested it was only half-a-day.

Dr. *W. S. Adeney*, an expert on water and sewage, who did much work for the Sewage Commission, expressed the opinion that the waters of the Avon were comparable with those of the Thames, and should be similarly treated. The Metropolitan Water Board had storage; and he regarded this of great importance.

Wednesday, April 30.

Witness, in cross-examination by Mr. KEEN, said he thought that double filtration was more likely to be sufficient in itself in a large works than in a small works; but he pinned his faith to thirty days storage. He pointed out that both the Local Government Board Inspector and the Medical Officer of Health for Christchurch had recommended storage.

Mr. *Brough Taylor* said he was of opinion that the present method of treating water by the Company was inadequate, inasmuch as there was no storage. The proper method to deal with river water was to impound it in order to give sedimentation, and follow this up by sand filtration. All the old London Water Companies had sedimentation reservoirs. In the present case, he would be satisfied with 21 days storage. He would pump daily the necessary quantity and draw off at the other end on to the filter-beds. The proposed four pressure filters would have an area of 1200 square feet, which would, however, in his opinion, be inadequate for giving even a rough preliminary filtration. The Company's pumping plant was also insufficient, inasmuch as it was not in full duplication. If the large pump broke down, the second one could not pump the full daily supply. Efficient filtration depended on the film on the top of the sand. Unless filtration went on continuously the film got broken, and when work was resumed the filtration was not complete. He understood that in the present case the filters were not continuously at work. Again, there should be 2 ft. 9 in. of sand in the filters; but when he visited the Company's works, there was only from 1 ft. 6 in. to 1 ft. 9 in.

In answer to Mr. BALFOUR BROWNE, in cross-examination, witness said he estimated the cost of a sedimentation reservoir at £10,000; but Counsel suggested that it would be much higher. On the question of chlorination, witness did not agree with this as a reserve, and even in the case of the Reading Corporation said they would be well advised to put in a storage reservoir. He agreed that the Avon water would be better than that of the Thames if it were equally well policed, and that it was the duty of the local and county authorities to see to this. Nevertheless, he persisted in the view that sedimentation would still be required.

This closed the case for the Bournemouth Corporation.

Mr. BALFOUR BROWNE, replying for the promoters, asked the Committee not to look with favour upon the attack on the Company by the Corporation. On the question of storage, there were thousands of cases of river water being used without storage. He mentioned the South Suburban Water Company, who took water from the Thames and did not have storage. Lack of necessity for storage in the present case was shown by the fact that whereas the Royal Commission on Sewage Disposal said that one part of sewage to 500 parts of water was safe, the Avon only had one part of sewage to 20,000. Although the river had a volume of 300 million gallons, the Company only took 300,000 gallons a day. He asked the Committee not to put any purchase clause on the Company, because under section 52 of the Public Health Act of 1875, the Corporation could come in and supply themselves if the Company were not doing their duty. Further, Christchurch, and all other Councils in the Company's area of supply had a right to be heard on such a question; while, in addition, the Bournemouth Corporation had no mandate from the ratepayers to purchase. He had brought evidence to show that the Company were supplying a pure water and were doing all that was possible to maintain a pure supply; and it was the duty of the local authorities to see that pollution did not take place.

The CHAIRMAN, after consultation, announced that the Committee thought the Bill should proceed as it stood; but they expressed the opinion that the local authorities in the whole district should take the greatest care in every way they possibly could to prevent the pollution of the River Avon.

ROCHFORD RURAL DISTRICT COUNCIL BILL.

HOUSE OF LORDS COMMITTEE.—Wednesday, April 30.

(*Before the Marquis of* BRISTOL, *Chairman*, *Lord* FERRERS, *Lord* RAVENSWORTH, *Viscount* HOOD, *and Lord* PLUNKET.)

The object of this Bill is to transfer the water undertaking of the Council to the Southend Water Company, and incidentally to extend the area of supply of the Company.

Mr. H. A. RAM, K.C., and Mr. F. N. KEEN appeared for the promoters. The Bill was opposed by the Port of London Authority, represented by Mr. LYNDEN MACASSEY, K.C.; the Essex County Council, represented by Mr. J. G. TALBOT, K.C.; and the Rochford Parish Council, represented by Mr. G. J. NALDRETT.

Mr. KEEN explained that if the areas of supply proposed were added to the Southend Company's limits it would mean that the whole of the Rochford rural district would be given to the Company. The proposal to sell was unusual; but the Council's water undertaking had been a source of difficulty, hence the desire to transfer it to the Company. The supply was commenced in 1903; and the works consist of a deep well and pumping station at South Benfleet, whence water is pumped to a tower a mile to the north. The total cost of the works has been £33,682; and of this, the sum of £20,372 was outstanding as unpaid loans. The receipts last year were £2536; but after meeting expenditure and capital charges, there was a deficit of £646, which is equivalent to a 4¾d. rate. The charges for water, in addition, are high—being some 25 per cent. more than in the case of the Southend Company's other area. There had also been a difficulty in apportioning the deficit among the various parishes concerned. This was the real reason for the Bill. Owing to the system of apportionment of the charges to the various parishes which the Rural District Council were compelled by law to adopt, the deficiency was not equally borne by the parishes supplied—indeed, one of the parishes actually had a credit; and the Rural District Council had come to the conclusion that it was unfair. Faced with this position, and also the prospect of further capital expenditure in order to extend to other districts, which there were legal difficulties in the way of, owing to the trouble of apportioning the costs and revenue, the Council had decided to take the steps proposed in the Bill. Another difficulty was that the yield of the Council's well was diminishing, in addition to which the Local Government Board recently refused, mainly on the opposition of the various Councils, to sanction a loan of £10,000 for extending the works. Subsequently, as a result, a Special Committee recommended a sale to the Southend Company, who were the only possible purchasers. The terms of purchase were that the Company should pay off the outstanding loans and also the cost of new mains, &c., incurred since last November, when the agreement was signed. The consumers would also get the lower prices for supply now charged by the Southend Company, and the ratepayers would be relieved of the deficiency rate which had to be apportioned annually. The Rochford Parish Council were against the proposal, for the reason that the Council were the only one deriving any profit from the water undertaking owing to the method of apportionment of the deficit. The Port of London Authority and the Essex County Council also appeared with a view to securing protective clauses. The only preamble opposition was that of the Rochford Parish Council.

Mr. *H. J. Mitchell*, a member of the Rochford Rural District Council, gave the history of the water undertaking as outlined by Counsel. There were 28 miles of mains, into which the water flowed by gravitation from the water-tower already mentioned.

Mr. NALDRETT cross-examined to the effect that, in the event of the transfer being made, the Rochford Parish Council would lose the profit which they now made out of the water undertaking. Witness agreed, but pointed out that all the other parishes were being annually charged with a deficiency rate, which was, in his opinion, unfair. Counsel also brought out the fact that a sum of about £15,000 would be lost by the transfer; but the Rural District Council, said witness, preferred to do this rather than face a recurring annual loss. The Company, it was also explained, would pay the instalments of the outstanding loans on the undertaking as they fell due. Counsel made the point that if the Southend Company did not, for any reason, pay the instalments as they became due, the loans would still remain a charge upon the rates. These were, however, the same terms upon which the Southend Company were now purchasing the water undertaking of the Leigh Urban District Council.

Dr. *J. C. Thresh*, the Medical Officer of Health for the County of Essex, who appeared under an order of the House, spoke of the difficulties of maintaining an adequate supply of water in the Rochford district of Essex, and said he regarded the arrangement of the Bill the best for all concerned, especially as the area of the Southend Company surrounded the Rochford rural district. In his opinion, the purchase price was about £1000 more than the works were worth.

Mr. *E. M. Eaton*, the Managing Director to the Southend Water Company, was also called in support of the Bill. His Company had 24 wells in use, and another in reserve. His own private valuation of the Council's plant came so near to the outstanding loans that it simplified the matter very much to accept the latter.

In cross-examination, witness agreed that the Rochford area would give him the advantage of an additional area for sinking wells, and that in return for this he was prepared to supply an area which, in itself, was not worth much to him.

Thursday, May 1.

Witness having been further cross-examined this morning, local evidence was called as to the position in the other parishes which are now contributing towards the annual deficit on the Council's water undertaking.

Mr. NALDRETT, addressing the Committee on behalf of the Rochford Parish Council, said that they protested against the proposed transfer on the ground that it would mean quite a considerable financial loss to them. There was no precedent for a rural district council desiring to sell their water undertaking to a company. If the transfer were carried out, the amount which had been paid off the loan on the undertaking would be lost; while the Water Company were virtually extending their borrowing power on the security of the rates of the rural district. Should the Company fail to discharge their liabilities, the loss would fall upon the ratepayers. The right course to have adopted was for the Company to pay off the loan at once.

The CHAIRMAN asked whether the undertaking could be kept separate from the remainder of the Southend Company's undertaking, so that in the event of failure of the Company the works could revert to the Council.

Mr. KEEN, on behalf of the District Council, said this could not be done.

Mr. NALDRETT then called evidence in support of the case of the Rochford Parish Council.

Mr. *W. C. Woods*, the Clerk to the Parish Council, admitted in cross-examination that there was considerable feeling in the other parishes

that the Rochford Parish Council were making a profit on the water undertaking; whereas all the other councils had to help to make up the deficiency.

There were also called several other witnesses, who expressed themselves as unfavourably disposed towards the transfer, on the ground that the Rochford Parish Council were well satisfied with the present state of affairs.

Mr. KEEN, in summing up the case for the promoters, said the whole object of the opposition was to keep the small profit now made by the Rochford Parish Council. But the Rural District Council believed it was in the general interest of the whole district to be relieved of a very difficult obligation.

The Committee decided that the preamble of the Bill was proved.

ADJUSTMENT OF CLAUSES.

The consideration of clauses was then commenced. The first case was that of the Essex County Council. Two proposed clauses relating to the breaking-up of roads, and relieving the County Council from liability in the case of damage to the Company's mains by the passage of heavy traction engines, unless the County Council had previously approved the position of the mains, were disapproved by the Committee on the ground that no evidence had been given to show special circumstances to warrant an alteration in the general law.

Friday, May 2.

Further consideration was given to clauses this morning. The County Council secured a clause providing that the Company must give a supply in any portion of the added area if the demand was equal to 5 per cent. on the capital expenditure involved, but were refused a clause by which the Company would lose their right of supply to any parish if mains were not laid there within five years.

Finally, the clause opposition of the Port of London Authority was taken. The point was in connection with the "Hard"—a causeway connecting South Benfleet with Canvey Island—which was also the subject of discussion on the Tilbury Gas Bill recently. This causeway was only usable at low water, and the Port of London Authority claim that it is part of the bed of the river over which they have the right of freehold, which carries with it the right to charge a rent to anyone carrying mains across it. The Committee, however, refused to allow the Authority to charge a rental for the use of the "Hard," but granted a clause giving them the right to approve the position of the mains, subject to an appeal by the Company to arbitration.

The Bill was then reported for third reading.

BISHOP'S WALTHAM WATER BILL.

HOUSE OF COMMONS COMMITTEE.—Friday, April 25.

(*Before Sir* HARRY SAMUEL, *Chairman*, *Mr.* SILVESTER HORNE, *Sir* GILBERT WILLS, *and Mr.* ALBERT SMITH.)

The principal object of this Bill is to transfer the undertaking of the Bishop's Waltham Water-Works Company to the South Hants Water-Works Company.

Mr. BALFOUR BROWNE, K.C., and Mr. W. M. ACWORTH appeared for the promoters. Mr. VESEY KNOX, K.C., and Mr. F. N. KEEN represented the only opponent—the Droxford Rural District Council.

Mr. BALFOUR BROWNE, in opening, said that the Bishop's Waltham undertaking was started in 1872 by Mr. James Simpson, of Westminster. It was started as a private water-works for the supply of the district, and land was taken for the site of a reservoir, which still exists. Mr. Simpson carried on the concern until 1893, when it was formed into a statutory Company, with a capital of £10,000; and in the following year a Provisional Order was obtained giving the Company the area of supply included in the parish of Bishop's Waltham. In the same year, the South Hants water undertaking, which has a large area of supply, obtained an Act of Parliament which enabled them to supply in Bishop's Waltham. But under section 5 of the Act the South Hants Company could not supply in Bishop's Waltham without the consent of the Bishop's Waltham Company, In 1899, the South Hants Company promoted a Bill for erecting a new pumping-station to the north of their district, and also proposed to purchase the Bishop's Waltham undertaking. In March, 1899, the Droxford Rural District Council also wrote asking if the Bishop's Waltham Company would sell their undertaking. The Directors replied stating what the capital involved in the undertaking was, and asked what the Rural District Council would be willing to give. At one time in the negotiations they offered to sell for £3355. The idea, however, was dropped, and nothing more came of the proposals. Both Companies were satisfied that the terms of purchase now proposed were fair—namely: That the South Hants Company shall pay in cash (*a*) the sum of £11,212 10s., (*b*) the sum by which the capital expenditure of the Bishop's Waltham Company exceeded the issued capital of that Company on Dec. 31, 1911, in addition to the amount of the capital expenditure from that date until the transfer; (*c*) a sum representing a valuation of the stores, &c. In the event of the present Bill not being passed, the provisional agreement shall be void. The Droxford Rural District Council, added Counsel, were opposing in order to limit the amount of water taken from the Bishop's Waltham well to a maximum of a million gallons per day, and they also required that the area of supply from the Bishop's Waltham well should be extended from the present 1 mile to 1½ miles. The promoters objected to any limit being placed upon the amount of water taken from the well, and also saw no reason for the extension of the area to be supplied from the Bishop's Waltham well, as it would result in an overlapping of the existing areas of the two Companies.

Mr. *H. C. Head*, the Chairman and Engineer to the Bishop's Waltham Company, gave evidence in support of the Bill.

In cross-examination by Mr. VESEY KNOX, witness said that at present there was no limit to the amount of water which the Company could take from the Bishop's Waltham well. Past experience showed that the pumping from this well had no effect upon the surrounding neighbourhood.

At the conclusion of witness' evidence,

Mr. ACWORTH said he would agree to the extension of the area supplied from the Bishop's Waltham well to 1½ miles if this would result in the opposition of the Droxford Rural District Council being withdrawn. The offer, however, was not accepted.

Mr. *William Matthews*, the Consulting Engineer to the South Hants Water Company, stated that the Company would require 3 million gallons per day in the summer time from the Bishop's Waltham well. He estimated that in ten years an additional 1,300,000 gallons would be wanted from this well. He did not believe that the pumping of the water they required would at all deplete the amount of water in the other wells surrounding.

Mr. KEEN, in cross-examination, asked whether it would not be fairer to take their supply of water from two wells and not draw it all from the one. Witness said this would be advisable if the drawing from one well only was causing any damage to others near it; but he did not see why money should be wasted in this manner if the drawing from one well was not damaging others.

Mr. *E. M. Eaton* was also called in support of the proposals in the Bill.

This closed the case for the Bill.

Mr. *Wilberforce Cobbett*, a Fareham engineer, was called for the Droxford Urban District Council, and stated, as the result of twenty-four years' experience of the district, that he knew that the springs in the vicinity of Bishop's Waltham and close to the pumping-station were the chief sources of supply for the whole of South Hants. The flow diminished considerably in the summer months; and it was for this reason that he supported the limit of a million gallons per day.

Mr. ACWORTH asked whether, if a limit of one mile and unlimited pumping powers were granted, there would be any complaints from people round about with regard to the depletion of surrounding wells belonging to other people, including the Rural District Council; but witness could not express any opinion on this.

Tuesday, April 29.

Dr. *A. V. Maybury*, an owner of property in Bishop's Waltham, was this morning called against the Bill, on behalf of the Droxford Rural District Council. He alleged that any interference with the other springs in the district would injure the whole population. There were a very large number of market gardeners and small holdings owners who depended on the other springs for their supplies; and any reduction of the water level through the Company's pumping would be most injurious. These people had come from time immemorial to certain springs on his property and taken water free of charge.

Other evidence was called to show that the local millowners and others depended upon the natural wells and streams for their supplies, and that the Company should be restricted in their pumping powers in order that these sources should not be depleted.

Mr. *J. Whittaker* was the final witness for the Droxford Council. He said that the water level in the district varied considerably between winter and summer, although, on the whole, he regarded the district as one in which there was a plentiful supply of water. He did not think the Company should have unlimited pumping powers, although in cross-examination he would not put the limit at any particular figure. This, he said, ought to be negotiated between the parties. As to the 1½ miles radius within which the Company should pay compensation to anybody who could prove damage from the Company's operations, he did not believe that the Company would have seriously contested this had not the Council pressed for a limitation of the pumping powers.

Mr. ACWORTH, for the promoters, assented to this.

Mr. VESEY KNOX, in his final speech on behalf of the Droxford Rural District Council, mentioned various precedents for what he was asking, and argued that if by the Company's pumping operations they depleted the other streams or wells in the neighbourhood, an amount of damage would be done which could not be measured by money compensation. In view of Mr. Whittaker's evidence, however, he did not think he could any longer press for the one-million gallon limit, although there should be some limit. He did press, however, for an extension of the limit of the area within which the Company should compensate owners who were damaged, from one to one-and-a-half miles.

Mr. BALFOUR BROWNE, replying on behalf of the promoters, reminded the Committee that under the Bill the Company were bound to provide compensation water in order to keep up the level of the streams, &c., and, in addition, the Company would also have to pay compensation in money to any person within a radius of one mile of the Bishop's Waltham well who could show damage from the Company's operations. Further restrictions would be unfair, inasmuch as they would cause the Company to incur expense which must inevitably fall upon the consumer. He was also willing to give an undertaking to extend the Company's mains to the Bishop's Chase district on a 5 per cent. guarantee; so that even if the wells in that district were depleted, a water supply would be available.

The Committee, after deliberation, passed the preamble of the Bill, subject to the mile radius for compensation purposes being increased to 1½ miles, that the clause with regard to compensation water should apply to ponds and watering places as well as wells that already exist, and that the Company undertake to give a supply to Bishop's Chase on a 5 per cent. guarantee for three years. No limit was placed upon the Company's pumping powers.

The Bill was then ordered to be reported for third reading.

BRADFORD CORPORATION BILL.

The clauses relating to the water portion of the Bill promoted by the Bradford Corporation (a report of the proceedings on which was given in the last issue of the "JOURNAL," p. 338), were mentioned in the Marquis of Bristol's Committee last Tuesday. As already indicated, the outside districts agreed the substance of a clause with the Corporation, the latter understanding that they should, as provided in

the Bill originally, have the exclusive right of supply in these districts. When the clause was presented by Counsel for the local authorities, however, it was seen that it did not provide for the Corporation's exclusive right to supply; and as the whole matter would have to be fought out before the Committee, it was decided to take the clause later in the week. In the meantime, a clause protecting Mr. Thornhill was added to the Bill. Mr. Thornhill's Counsel made an application for costs, on the ground that the Corporation had unreasonably and vexatiously put him to expense in opposing the Bill. The reason for the application was that the Corporation had, prior to the Committee stage, refused to discuss with Mr. Thornhill any form of clause for his protection. The Committee, however, refused to grant costs.

The clauses in the water portion of the Bill were finally adjusted on Friday; the dispute between the local authorities and the Corporation on the question of the latter having the exclusive right of supply having been settled. The Bill now definitely lays it down that the water area of the Corporation shall comprise the city and the following parishes and places: "Addingham, Apperley, Bingley, Birkenshaw, Birstall, Burnsall, Calverley, Clayton, Cleckheaton, Denholme, Draughton, Drighlington, Farsley, Gildersome, Gomersal, Hunsworth, Liversedge, Micklethwaite, Morton, Pudsey, Queensbury, Shelf, Shipley, Silsden, and Wilsden, all in the West Riding of the County of York." Within the limits the Corporation are to have the exclusive right of supplying water in this area, subject to a few special clauses relating to one or two districts. Any of the local authorities have the right to call upon the Corporation for a supply in bulk, and may also require the Corporation to undertake the distribution in their area. In this latter event, the Corporation may also be required to take over any existing distributing works at a price agreed between the parties, or to be determined by arbitration. In the case of Shipley and Liversidge, however, the Corporation may not supply water without the consent of the Local Authority as determined by the Committee. The existing rights of landowners are preserved by the Bill.

MID KENT AND EAST KENT DISTRICT WATER BILL.

This Bill was last Thursday before the Unopposed Bills Committee of the House of Commons, and was sent forward for third reading. The objects of the Bill are to authorize the construction of new works, to confer further powers upon the East Kent District Water Company, and to authorize agreements between the East Kent, Mid Kent, and South Kent Water Companies. New capital to the extent of £80,000 may also be raised by the Mid Kent Company, and £45,000 by the East Kent Company. The combined Companies supply in 140 parishes in Kent. Originally the Bill was opposed by 25 local authorities. This number dwindled down to 5, and these were subsequently withdrawn; the condition being that mains should be laid within a specified time in their districts. Another part of the bargain is that the local authorities have given a guarantee as to revenue. Among the clauses added since the Bill was originally introduced is one which allows the Company to supply both sides of a street where the parish boundary runs down the centre of the road. Another new clause relates to water used in private motor-car garages. It was alleged that there are a large number of motor-cars housed in the area, in which an excessive quantity of water was used for cleaning purposes, but which hitherto had come under the definition of domestic supply. By the clause in the Bill, a charge of 10s. per annum will be made for this purpose. The Committee passed the clause, notwithstanding a suggestion by the Local Government Board that the charge of 10s. a year should only be made if a hose were used.

Colwyn Bay Gas-Works Results.—The profit on the Colwyn Bay Urban District Council gas-works for the past year was £2132, in addition to which there has been spent out of revenue on what might fairly be called capital account, and concessions have been granted to consumers, amounting altogether to £1426. Thus, as Mr. G. Bevan, the Chairman of the Finance Committee, informed the Councillors, the gas-works have really made a profit of £3558.

Nottingham Gas Workers and the Union.—In furtherance of the trade unionist propaganda, and with the especial aim of enlisting all gas workers within the ranks, Mr. Will Thorne, M.P., made Nottingham the scene of his last Sunday's effort. He complained in general terms that there were many gas engineers' labourers not receiving more than £1 a week; but there was no attempt made to show that any specific grievances exist in relation to the terms of employment under the Nottingham Corporation. Meanwhile, many of the Nottingham employees, despite perfervid appeals, appear quite content to remain outside the trade union ranks, obviously satisfied that legitimate grievances will never be lightly ignored when proper representation is made to those entrusted with the control of affairs.

"Water and Light" at Belfast.—The tercentenary of Belfast's existence as a corporate entity occurred on the 27th ult.; and among the reviews of the city's progress a reference by Mrs. Mary Lowey, in her "Story of Belfast," to "Water and Light" has attracted some attention. Miss Lowey records that "it was an exciting evening when the streets were lighted with gas for the first time;" and that "the Town Council turned out to see the effect, and the members walked arm-in-arm along the streets admiring the illuminations, and very proud indeed of such a brilliant town." She adds: "From the open river and the wooden pipes to our magnificent water supply of the present time, and from the small candle stuck in a window-pane to the great globes of light as bright as noon-day, is a wonderful change." The "Belfast News Letter" recalls that in 1686 the Corporation ordered that "from the 29th of September to the 25th of March, except in moonlight, each inhabitant shall hang out from his door or window a lantern with a candle for three hours, beginning at seven o'clock in the evening." It is mentioned that gaslight was first introduced in the borough in 1823 by private enterprise, and that the works became the property of the Corporation on July 1, 1874; proving to be an excellent investment, and one of the city's most valuable assets.

LEGAL INTELLIGENCE.

BRISTOL WATER COMPANY'S RATING APPEAL.

In the King's Bench Division of the High Court of Justice, Justices RIDLEY, PICKFORD, and AVORY recently heard the case of *King v. Recorder of Bristol (ex parte Bristol Water-Works Company)*.

Mr. FOOTE, K.C. (with him Mr. WETHERED), said he had to show cause against two rules—one for *certiorari* and the other for a *mandamus* to the Recorder to hear an appeal against a poor-rate. He understood the Recorder was willing to state a case for the opinion of the Court. The Water Company appealed to Quarter Sessions against a rate, on the ground that the Guardians, who owned the workhouse, were rated too low. The question turned on the construction of the Acts of 1862 and 1864, which provided that, in the event of third parties being served with notice of objection to an assessment, 28 days' notice should be given after the valuation list was lodged. This had not been done in the present case, and consequently there was no appeal.

Mr. RYDE, K.C. (with him Mr. INSKIP), supported the rule. He said the notice of objection by the Company was given on May 30, 1911, and the hearing took place on July 21. An adjournment was granted, in order that the Overseers might put forward what they suggested were the proper figures. The value of the property objected to was £3246. On Sept. 19, the case was further considered, and the Overseers' valuer reported that the true figure should be £14,530. The Committee ordered a further adjournment, so that they might appoint someone to value the property; and on Dec. 11 this gentleman reported that the true figures were £8587. Throughout the Committee had purported to hear the objection.

Mr. Justice RIDLEY: They heard it *de bene esse*, but said: "If you want to appeal we will enable you to do so by making a new valuation list; but you are out of time, as the notice was not given within the 28 days."

Mr. RYDE pointed out that if there was any distinction to be drawn between the Guardians and the Committee, whose property was being attacked, they did not object on the ground that the notice was out of time. He contended that Quarter Sessions had jurisdiction to hear the appeal, and that the rules should be made absolute.

Their Lordships reserved judgment, which was given last Tuesday.

Mr. Justice RIDLEY said the application was for a rule *nisi* to the Recorder of Bristol to hear and determine on its merits an appeal to Quarter Sessions against the poor-rate. The Bristol Water Company were the appellants; and the ground of the appeal was that the Guardians underrated premises of which they were occupiers. On the 11th of May, the Company gave notice of their objection to the Assessment Committee and to the Guardians of the Poor; the valuation list then in force having been deposited in February, 1910, and finally approved in March of that year. When the appeal came on, objection was taken that notice had not been given to the Overseers and Guardians within 28 days; and on this objection the appeal was dismissed. The question was whether the appellants were entitled to appeal without having given these notices; and the answer depended upon the proper construction of section 1 of the Act of 1864. By this Act several alterations were made in the previous Acts. The Assessment Committee were allowed to appear at Quarter Sessions to support the list, and appeals were prohibited unless objection had been made before the Committee and relief not obtained. It had been contended that section 18 of the Act of 1862 was left unrepealed by the Act of 1864, and that the notice to the Overseers and third parties must still be given before the appeal could be heard. He thought section 1 of the Act of 1864 was merely ancillary to the provisions of the Act of 1862, and that notice could be given at any time.

Mr. Justice PICKFORD concurred.

Mr. Justice AVORY said at the time when the Act of 1864 came into operation a ratepayer was entitled to appeal to Quarter Sessions against a rate at any time after the deposit of the list, without having objected to the valuation list itself. This right was recognized by the Act of 1862. The Act of 1864 imposed two conditions on the exercise of the right of appeal—viz., (1) that notice should be given to the Assessment Committee; and (2) that notice of objection to the list should be given to the Committee, upon which objection the appellant had failed to obtain relief. It provided that the Committee should hear the objection after notice given at any time, though the list had been approved; and if they amended the list on such objection, notice of the amendment had to be given to the Overseers. Section 1 of the Act of 1864 should be read as an amendment only of section 22 of the Act of 1862. The right to object under section 18 of the Act of 1862 still remained; and the only question was whether the notice of objection required by section 1 of the Act of 1864, which might be given at any time, was a notice to the Assessment Committee only, or whether it comprehended a notice also to the Overseers and to a third party whose assessment was objected to. Having regard to the provisions for notice of any amendment to be given to the Overseers, which seemed to contemplate that they might not be present, and to the provisions of the Act of 1862, which empowered notice to be given to third parties, it might be that notice to the Assessment Committee alone was sufficient under the Act of 1864; but, in any case, if this were not the correct view, he thought notice might be given to the other parties at any time that it was given to the Committee, and that section 18 of the Act of 1862 was not incorporated in the Act of 1864.

The rule for the *mandamus* was made absolute, with costs against the Guardians.

SUPPLYING IMPURE WATER TO A LAUNDRY.

At the Tunbridge Wells County Court last Thursday, before his Honour Judge Parry, the Ticehurst District Gas and Water Company sued Messrs. English and Co., proprietors of a laundry at Ticehurst, for £16 3s. 7d. for gas, water, and coke supplied. The defendants

made a counterclaim for damages for breach of contract on the part of the Company. Mr. Kingham appeared for the plaintiffs; Mr. Wardley represented the defendants. The Managing-Director of the Company (Mr. A. W. Lunt) said the Company arranged to supply the defendants with water. He explained that this was at times liable to discoloration, especially on the resumption of pumping after the stoppage on Sundays. The Company had tried to obtain an auxiliary supply, but had failed The defendants asked for some allowance on account of the discoloration of the water having involved them in expense; and the Directors made a concession. When Mrs. Fleming (part-proprietress of the laundry) complained in the summer of last year, he told her that the only way to obviate the difficulty was to have a service-tank, and fill it on Saturdays before pumping was suspended. There would then be sufficient water for Monday mornings. Witness added that he had done all he could to remedy the matter, and had given the defendants a quantity of coke. Mr. Wardley said a contract had been entered into; and he contended that plaintiffs were bound to supply water that was reasonably suitable for the purposes of the defendants' laundry. Mrs. Fleming was called, and stated that there was reason to complain of the water nearly every week last year. It was not merely discoloured, but thick with sand and mud. White clothes were the colour of varnished boards when taken out of the washing water. Work in the laundry was stopped at times. She had had to use extra fuel owing to the bad water, and had lost several customers. Mr. Kingham argued that the Company had not failed to supply anything they had contracted to supply. His Honour, in giving judgment, said the Company had contracted to supply good water, suitable for use in a laundry. They could have delivered it in a way that would have obviated most, if not all, of the damage that had occurred, or they could have turned the impure water out of the mains. It was most unreasonable that the water should be pumped into a laundry in such a dirty state when it could easily be cut off for a time. He did not think the whole of the damage alleged by the defendants had been proved; but certainly something should be allowed to them for loss of wages, &c. He would give judgment for the defendants on the counterclaim for £20 and costs, and for the plaintiffs on their claim, which was an admitted debt.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS PROFITS.

A Record Year.

Despite many unanswerable objections to the inequitableness of the process, particularly in its bearing upon large consumers, the majority responsible for the control of Nottingham municipal affairs show no relaxation of their determination to lay under contribution, to the utmost extent, the revenue of the Corporation gas undertaking, which represents the city's largest public trading concern. Last year a sum of £39,000 was allocated from the profits in aid of the reduction of local burdens, being £5000 more than had ever been previously taken; and upon this occasion, in the endeavour to avoid increasing the already high district rate, which stands at 6s. 5d. in the pound (this not including poor law charges, which make another substantial addition), it is proposed to appropriate the same large sum. In view of its present comparatively unprogressive state (the rateable value of the city increased during the last year by £10,634 only), it is not difficult to realize that Nottingham might be in a very poor way municipally without the large aid derived from its chief public ventures. An inability to utilize the profits of the gas undertaking to the extent herein indicated would mean an addition of more than 8d. in the pound to the district rate, seeing that it is estimated that a rate of 1d. will not yield a greater sum than £4700, while there are further to be taken into account £19,000 which it is proposed also to absorb from the profits on the tramways, and £8000 from the department dealing with the supply of electricity. Adding to this a revenue of £6380 from what is known locally as the Bridge Estate, there is the substantial total of £72,380 available in aid of the rates. Seeing that the gas profits are called upon to supply considerably more than half of the amount, there recurs the question which has been more than once raised as to how far gas consumers may be said to have legitimate cause for complaint. In support of the Gas Committee's action, the only argument attempted to be put forward during the debate last year, when Sheffield's considerably lower charges for gas were cited as a significant object-lesson, was that any reduction in price must necessarily benefit consumers resident in the district beyond Nottingham's municipal area, and that it is better, therefore, to apply the money in relief of the city's burdens than to allow, through diminished rates, an equal participation in advantages by those who, though consumers, have no direct share in the municipal liabilities. The contention was supported by reference to the fact that 25 per cent. of the gas consumers are resident outside the city. On the other hand, stress was not unreasonably laid upon the view that 25 per cent. of the total profits was far too large a proportion to be utilized in aid of the rates.

This year, however, the policy continues unchanged. Upon previous occasions it has been more than once contended by the Chairman and other responsible members that the Committee have a clear right, subject to the Council's approval, to apply the profits in what manner they think best; and, in the light of the past year's experience, indicating a record return, the claim may be advanced with possible added meaning. Never in the history of the gas undertaking has such a high level of results been attained; and Mr. John Wilkinson, in the second year of his responsibility for the engineering control and management of the business side of the enterprise, has reason for ample gratification. The report presented at yesterday's meeting of the Council on behalf of the Committee by the Chairman (Alderman Albert Ball) showed that the quantity of gas sold during the year ended the 31st of March amounted to 2,168,651,700 cubic feet, against 2,050,101,400 cubic feet in the previous year; being an increase of 118,550,300 cubic feet. The profits, as already indicated, constitute a record in the history of the undertaking. The total income for the year amounted to £376,072, and the expenditure to £246,767; leaving a balance of £129,305 carried to the profit and loss account. After deducting the interest on capital and the contributions to the sinking funds, and placing £2500 to depreciation of stoves, there remained a net profit, including bank interest, of £72,563 at the disposal of the Council; being £22,853 more than last year. The previous most successful year was that ended March 31, 1910, when the balance of the revenue account amounted to £110,297. The Committee recommended that out of the net profit the amount of £39,000 should be handed over to the Finance Committee in aid of the general district rate. They had disposed of the balance (£33,563) by placing £27,500 to the renewals fund; and they further recommended that the balance of £6063 should be carried forward for the purpose of meeting the extra expenditure which it is anticipated will be incurred during the current year owing to the increase in the prices of coal, materials, &c. The Committee also reported that the markets for coke, tar, and sulphate of ammonia had been very satisfactory during the past year. The income from this source showed an increase of £17,564 over the previous year, and £24,447 more than the year 1910-11.

The Committee remarked that the outlook for gas undertakings at the present time is somewhat serious. The combine of coalmasters on the one hand to increase the price of coal, and the determined effort on the other hand to depress the prices of residuals, especially sulphate of ammonia, which had fallen somewhat seriously during the last few weeks, would, they considered, materially affect future profits. All classes of materials used on the works, in addition to coal, had advanced in price to a serious extent. The coal and other material required for the present year were estimated to cost about £40,000 more than two years ago.

On the subject of the condition of the works, the Committee stated that at the Woodborough Road Depôt considerable improvements had been carried out—an electric hoist having been installed in the place of the old hand hoist. Extensive renewals and improvements had also been effected at the Giltbrook Chemical Works; No. 3 acid chamber and the Glover tower having been reconstructed. The Committee said they were most desirous of completing the rebuilding of the Radford works, one section of which is well in hand. It is intended to pay for the whole of this work out of the special renewals fund. When completed, these works will be capable of making 3 million cubic feet of gas per day, and will, it is considered, be one of the most up-to-date plants in the country.

The Committee closed their report with the statement that the whole of the works and the distributing depôt are in good condition; and when the alterations are completed, the works will compare favourably with any similar undertaking. The Committee hope to have the first section of the vertical retorts ready for carbonizing coal this year.

Report of the Gas Engineer.

Appended to the Committee's statement was the annual report of the Gas Engineer and Manager (Mr. John Wilkinson), which furnishes much interesting information.

Manufacturing Department.

Under the heading dealing with the manufacturing department, Mr. Wilkinson stated that during the year ended the 31st of March, 192,927 tons of coal and 108,155 gallons of oil were carbonized in course of manufacturing the following products: Coal gas, 2,175,133,000 cubic feet; water gas (equal to 1·61 per cent. of the total gas made), 35,720,000 cubic feet—total, 2,210,853,000 cubic feet. Coke (for sale), 81,036 tons; tar, 11,290 tons; ammoniacal liquor (10-oz. strength), 29,125 tons; sulphocyanide liquor, 7363 gallons. Of the total production of tar, 9427 tons were distilled at the Giltbrook Chemical Works, and yielded products as follows:—

Crude naphtha	60,546 gallons.
Crude carbolic	14,441 ,,
Creosote	411,727 ,,
Brick oil	41,278 ,,
Pitch	6,102 tons.
Naphthalene	148 ,,
Ammoniacal liquor (10-oz.)	914 ,,

In addition, 96,599 gallons, or 483 tons, of crude tar and 29,249 gallons of creosote were used for the manufacture of 125,848 gallons of specially prepared tar for road-spraying purposes. The Giltbrook works were also used for the manufacture of 2702 tons of sulphuric acid (100 per cent.) and 1394 tons of new oxide of iron. At the Basford works, 29,528 tons of 10-oz. ammoniacal liquor were distilled during the year, producing 2250 tons of commercial sulphate of ammonia; and 2385 tons of liquor were sold to outside chemical-works for the production of carbonate of ammonia. The contractors for the erection of the installation of vertical retorts at the Radford works have unfortunately experienced serious delay in obtaining deliveries of iron and fire-clay materials. It has also been found necessary to adopt special precautionary measures to deal with the large amount of water encountered in the excavations. In consequence of this, the installation will not be ready for work by the specified time; but Mr. Wilkinson sees no reason why it should not be ready by the end of September.

Distribution Department.

Dealing with work in connection with this department, Mr. Wilkinson gives the following details as to the sale of gas during the year: Ordinary consumers, 1,583,286,000 cubic feet; prepayment consumers, 486,916,900 cubic feet; public lamps, 98,448,800 cubic feet—total, 2,168,651,700 cubic feet. He says these figures compare very favourably with the total sale of gas the previous year—viz., 2,050,101,400 cubic feet—and indicate an increase of 118,550,300 cubic feet, or 5·78 per cent. The following are the comparative receipts for gas sold: Year ended March 31, 1913, £262,592; do., March 31, 1912, £248,910—increase, £13,682. The gas unaccounted for during the year was 42,201,300 cubic feet, or 1·91 per cent., compared with 53,872,600 cubic feet, or 2 56 per cent., for the previous year. Mr. Wilkinson remarks that it is difficult to explain the continued reduction

in the unaccounted-for gas. The usual corrections for atmospheric temperatures and pressures are made. But atmospheric conditions probably affect the figures from year to year; and, as stated in his previous report, he will not be surprised to see a slight reaction in the opposite direction.

There were 1403 additional consumers connected to the mains during the year; making a total of 79,742 at March 31 last, *plus* 7897 public lamps. The proportion of prepayment consumers as compared with ordinary consumers is 50·74 per cent., compared with 49·55 per cent. before. The average consumption per consumer equalled 25,572 cubic feet, against 24,626 cubic feet in the previous year.

The total length of mains is 397·82 miles, 3·46 miles having been added during the year. There were 2073 new gas services laid, against 2287 before. The number of meters fixed up to the 31st of March last (including 492 lamp meters) was 80,234, being an increase of 1409. Of these, 77,384 belong to the Gas Department, and 2850 to the consumers. The demand continues for prepayment meters. At the end of the financial year, 40,711 of these were in operation—an increase of 1649.

The application of gas for trade and domestic purposes, other than for lighting, continues to increase. There are at present in use about 33,171 cooking-stoves, 16,665 gas-fires, and 836 gas-engines, besides a very large number of other appliances of almost every description, which have not been numbered. Of the 33,171 cookers in use, 9460 are rented from the department, and 23,009 are supplied with the automatic meters rent free. The orders and calls for attention of various kinds from consumers were 87,567, against 98,646 the previous year.

An installation of boosting plant has been erected at the Radford works, for the purpose of giving increased pressures in the Stapleford and Sandiacre districts. The plant was available during the whole of last winter, and adequate pressures were easily maintained at the extreme limits of the area of supply. High-pressure mains have already been laid in one street, and will be extended along another to the Eastcroft works, where boosting plant will be erected; and a supply of high-pressure gas can be given to the consumers in the districts in which these streets are situated. The mains will also be available for street-lighting purposes if the Lighting Committee desire to utilize them.

General.

During the past year great difficulty was experienced in obtaining adequate supplies of coal, and therefore a large tonnage had to be taken from stock. Unfortunately, Mr. Wilkinson says, it is not yet possible to obtain supplies of coal in sufficient quantities to replenish the stock; but the special contracts recently arranged will no doubt enable an increase to be made to a satisfactory tonnage before the winter season. In addition to short supplies, he had been compelled to accept coal which, in his opinion, was inferior to the usual quality supplied; and consequently the working results had to some extent suffered.

The price of coal advanced continually during the year; and at the present time some of the coalmasters are demanding an advance of 50 per cent. on the contract prices of 1911. In his last report, Mr. Wilkinson drew attention to the Committee's purchases for forward delivery; and though the amount paid for coal during the year shows a substantial increase, he says it is certain that their judgment had resulted in a very large saving to the undertaking. The following are the comparative expenditures for coal and the receipts for residuals during the last two years:

	Expenditure for Coal.	Receipts for Residuals.
Year ended March 31, 1913 . .	£102,023 ..	£98,791
,, ,, ,, 1912 . .	89,045 ..	81,226

All the old coal contracts are now practically completed, and new business can only be effected at a very substantial advance. Every effort has been made to induce the coalmasters to modify their quotations for the usual yearly contracts; but they have not induced lower prices, and Mr. Wilkinson says it must be admitted that the profits for next year will be very seriously affected by the abnormally high price of coal. Unfortunately, no recompense can be anticipated from increased values of residuals; for, paradoxical as it may appear, the prices of coke, sulphate of ammonia, pitch, carbolic acid, and other products have already taken a decided downward turn. It is difficult to forecast with any degree of accuracy the residuals markets for a year ahead; but present prospects clearly indicate lower prices.

The usual yearly contracts for the various materials used in the different departments of the undertaking have been renewed at advances varying from 20 to 50 per cent. Successful financial results will be extremely difficult to obtain next year; but Mr. Wilkinson says "the large amount of time and business experience which the Committee devote to the welfare of the undertaking will ensure the highest possible efficiency being obtained." He takes the opportunity of thanking the Committee for their kind permission to visit several of the most important Continental gas-works in company with the Chairman; and he is quite satisfied that the information obtained will result in material advantage to the department.

The actual result of the revenue account for the year is represented as follows: Total receipts, £376,072; total expenditure, £246,767—gross profit, £129,305. The gross profit for the previous year was £106,595. With regard to the disposal of the surplus profit for the year, Mr. Wilkinson reminds the Committee that a substantial sum will be required to complete the reconstruction of the remaining portion of the carbonizing plant, together with the necessary condensers, purifiers, scrubbers, &c., at the Radford works.

Appended to the report are tables showing the development of the undertaking during the last ten years, and the comparative workings per ton of coal carbonized and per 1000 cubic feet of gas sold for the years ended March 31, 1912 and 1913.

Some Items in the Accounts.

A detailed examination of the accounts reveals *inter alia* that if bad debts in regard to general commercial concerns worked out at as small a percentage as those in connection with the Nottingham gas undertaking, there would be little need for anxiety. Considering the extent of the operations involved, it is a testimony to the alertness of the collecting staff that only £377 was represented under this heading in Nottingham last year. The annuity capital account of the concern now stands at £313,750; the total of annuities repurchased being £55,684, and the maximum yearly annuity amounting to £3 5s. The city's large responsibility in the undertaking was represented by the formidable figures £1,064,400, which, including the annuity capital already referred to, is also made up as follows: Loan capital, £230,677; debentures, £55,520; consolidated stock, £464,462. There are in existence 6275 annuities, each of the nominal value of £50; 622 of these having been purchased and cancelled at a cost of £31,100. During the past twelve months, the expenditure on coal, including carriage, unloading, and expenses of depositing on works, was £102,023; and the repair and maintenance of works and plant are represented by an expenditure of £41,392. In the distributing department, the chief items contributing to a total of £45,227 are: Repairing and refixing stoves, £13,925; repairing, renewing, and re-fixing meters, £7000; and repair, maintenance, and renewal of mains and service-pipes, including wages, £13,850. There has been some criticism forthcoming at times at the Council meetings as to the amount of the reserve fund, and in this respect it is of interest to observe that the amount now stands at £161,760, which, relatively to capital involved, has been claimed to compare very favourably with figures pertaining to other large corporation gas undertakings. But that, in the interest of sound finance, the reserve may yet have to be augmented, cannot be regarded as an improbable business contingency. In this light, salient considerations as to depreciation, enhanced cost of coal, and diminished receipts from chemical products cannot be excluded from the estimate. The Corporation have hitherto had something in the nature of a good milch cow in their chief trading concern; but obviously the milking process cannot be prolonged for an indefinite period.

Council Receive Report.

In moving the reception of the Gas Committee's report at the meeting of the Town Council yesterday, Alderman Ball pointed out that next year, owing to the enormous increase in the price of coal, the results might not be quite so satisfactory as those now presented. The Committee's policy was to make the works thoroughly up-to-date, and pay the cost out of revenue. Mr. Richards contended that the price of gas in Nottingham was inordinately high. In the course of the debate, the work of the Gas Engineer was highly eulogized. The report was received. It transpired during the proceedings that the Gas Committee originally proposed to devote only £34,000 in relief of the rates, but that the Finance Committee exacted a larger sum.

PRIMITIVA GAS COMPANY OF BUENOS AYRES, LIMITED.

The Twelfth Annual General Meeting of this Company was held at the London Offices, River Plate House, E.C., last Tuesday—Mr. A. E. Bowen (the Chairman) presiding.

The Secretary (Mr. J. Macmorran) having read the notice convening the meeting, and also the Auditors' report to the shareholders, the report of the Directors, with the accounts for the year ended Dec. 31 last, some figures from which were given in the "Journal" for the 22nd ult. (p. 277), was taken as read.

The Chairman, in moving the adoption of the report and accounts, referred to his absence in Buenos Ayres at the time of the last general meeting, and reminded the proprietors that he left some remarks which the Secretary read. What he had now to say was much in the same strain. The Company had had a good year and a bad one, inasmuch as the increase in the quantity of gas sold in 1912 over 1911 was no less than 5¾ per cent. This meant a very considerable figure, because the sales amounted to about 2500 million cubic feet. The demand for cooking stoves, heating appliances, &c., showed even greater improvement than during the preceding year. But, on the other hand, coals, instead of declining in price, as he thought possibly might be the case when his remarks were read last year, had been higher. Freights had improved, as they had fallen 2s. or 3s. per ton; but this decrease had been almost swamped by the higher prices which had to be paid for coals; and gas oil had reached a figure which was almost prohibitive. He might mention that oil put into the Company's works went up in cost from £4 19s 2d. per ton in 1911 to £7 4s. 9d. in 1912, or an average of £2 5s. 7d. per ton—more than 50 per cent.; while the average cost of coal delivered was 31s. in 1911 and 36s. in 1912. The total increase in the cost of crude materials had, therefore, been some £83,800 more than it was during 1911. Besides this, he thought pretty nearly everything that could happen to cause worry in connection with the business had occurred. During the early part of the year, there were serious labour troubles with the stokers and carters, which necessitated the keeping and feeding of some 52 soldiers and 130 horses on the works for nearly two months. Then there was the great coal strike in England; and coals had to be bought both from America and Australia. These were not up to the usual standard, giving a poor yield of coke and requiring much extra labour in handling. The average price of some 15,200 tons of this coal was no less than 42s. 6d. per ton c.i.f. Buenos Ayres. Then they had a great deal of trouble with a new bench of retorts at the Corrales works. It was not quite clear what was the cause of it; and the Directors sent out the Secretary (who only returned on the preceding day) to investigate the matter. The Directors consequently had not had an opportunity of hearing from him the whole of the results of his inspection trip. The cost of labour in Buenos Ayres was constantly increasing. During the early part of the year, they had to give an increase to the stokers of 20 c. to 30 c. per day; and the pay of a good many of the other employees had also to be advanced. However, he hoped and believed that the Company had now got to the end of most of their troubles. When he was in Buenos Ayres, he made a thorough examination of the whole position, and, as a result, appointed as their General Manager Mr. William Angus, who had for a long period been with the ex-New Company.

He thought the proprietors would agree with him that, under all the adverse circumstances to which he had referred, they did fairly well last year, as the decrease in the revenue account was less than £16,000, although, as he had already said, the crude materials cost £83,800 more than in 1911, and this on the top, if he remembered rightly, of an increase of some £23,000 from 1910 to 1911. They would understand, therefore, that when prices of these materials came back to somewhere near normal figures, they ought to do fairly well. He was pleased to say that, since the books closed on the 31st of December, the increase in the quantity of gas sold continued to be very satisfactory. It would be seen from the report that the network of mains was extended during the year by more than 25½ miles; while, owing to 8410 new services having been put in, there were now 192,618 in use. This had entailed capital expenditure to the amount of £206,566; and, in order to provide the money, the Directors sold 10,000 ordinary shares at a premium of about £2 each. Having made some explanatory remarks in regard to this issue, the Chairman said he thought the Company's heavy capital expenditure was now coming to an end. The chemical works, which had cost upwards of £100,000, were finished and working; and the Directors hoped they would prove very profitable. As was the case with most gas companies working in England and on the Continent, the residuals were the best paying part of the business. He did not think there was any other general information to give the proprietors, except to tell them that business in Buenos Ayres continued to be very prosperous. Turning to the accounts, the Chairman dealt with them in detail, and concluded by submitting his motion.

Mr. H. E. JONES, in seconding, said there were two things in connection with last year's working which struck him as being very satisfactory. First, there was the increase in the mains by more than 25½ miles, and the enormous addition to the number of consumers—viz., 8400; and, secondly, there was the considerably increased quantity of gas sold, which had been used chiefly for heating, cooking, and other domestic purposes and for power as well, all of which were so remunerative, and which in England had shown such profitable results. He was glad to find that on the other side of the sea this system was also prevailing; and it must inure to the proprietors' benefit.

After some remarks had been made by shareholders, the motion was carried unanimously.

The CHAIRMAN then moved: "That the balance of the profit and loss account—viz., £135,980 7s. 6d.—be divided as follows: For the payment of a final dividend of 4s. 6d. per share, less income-tax, making a total distribution of 8 per cent. (less income-tax) for the year on the ordinary shares of the Company, which will absorb £58,500; to the pension fund, £2000; to the Retiro works amortization account, £35,000; leaving to carry forward to the new account £40,480."

Mr. C. P. OGILVIE seconded the motion; and it was carried.

The retiring Directors (Messrs. J. D. Pearson, F. C. Im. Thurn, and J. M. Tulloch) and Auditors (Messrs. G. A. Touche and Co.) having been re-elected,

A vote of thanks was accorded to the Local Committee in Buenos Ayres and the staff there and in London.

The SECRETARY, in acknowledging the compliment, gave some particulars in regard to the extent of the work done in Buenos Ayres; the Company having three large gas-works, new chemical works, and fourteen branch offices. He was sure the staff there would much appreciate the vote. They had gone through a very trying time; having had two months of the hottest weather they had experienced for many years.

Liability for Damage through Water Leakage.—At the Ennis (co. Clare) Quarter Sessions, His Honour Judge Bodkin, K.C., recently made a decree for £6 against the Ennis Urban District Council at the suit of Andrew Taylon, of Cappalea, for damage done to his land by flooding, due to defendants' carelessness in allowing pipes conveying the water supply to the town to be broken. His Honour censured the Council's Engineer, and held that it was not an excuse to say they had given instructions about the matter.

Oldbury Gas Undertaking.—At a meeting of the Oldbury District Council on Friday, the Gas Committee reported that during the twelve months ending March 31 the quantity of gas sent out was 160,452,000 cubic feet, against 150,003,000 feet for the previous year. Mr. Wortley gave notice of his intention to move at the next meeting of the Council a resolution asking the Gas Committee to revise the scale of charges for slot-meter users, now standing at 3s. 4d. per 1000 cubic feet, and no discount, with the object of securing a cheaper supply for the working classes.

Triumph for Gas at West Bromwich.—The Highways Committee of the West Bromwich Corporation have just taken an important step affecting the gas undertaking. For some years past, the High Street has been lit by electricity; but the removal of the centre tram-poles made it necessary to re-arrange the lighting for a distance of over a mile. At the request of the Committee, the Gas and Electricity Departments carried out a series of experiments; and, after inspection, the Highways Committee have decided that the road in question shall be lighted by means of high-pressure gas-lamps, at an annual cost of £340. This action has been taken because the Committee are convinced that gas is the cheaper and more effective illuminant.

Stokers' Wages at Batley.—The Gas Committee reported at the last meeting of the Batley Town Council the receipt of an application from the stokers of the Corporation gas-works for an increase in wages of 4d. per shift, an eight-hours day all the year round for coke wheelers, and a seven days' annual holiday, instead of five. The Committee only agreed to the 4d. per shift increase. Mr. Winfield moved that the matter should be referred back for further consideration. He said that they were only granting an increase of 4d. per shift, while Dewsbury had allowed 6d. Mr. Child thought the gas stokers were fully entitled to a seven days' holiday in a year. They worked seven days a week; and as the gas undertaking was making good profits they could easily afford to grant the holiday. Mr. Ramsden understood that it was impossible to carry out all the conditions without employing three extra men; and therefore he would not support the amendment. The amendment was defeated, and the minutes were approved.

EXAMINATION IN "COAL-TAR DISTILLATION."

The City and Guilds of London Question Paper.

The following questions were set in the examination in Grade I. in "Coal-Tar Distillation and Intermediate Products" conducted by the City and Guilds of London Institute on the 1st inst. Three hours were allowed for the paper; and not more than eight questions were to be attempted. The numbers at the ends of the questions are the maximum marks obtainable.

1. Describe a practical method for determining the specific gravity of crude tar. How many tons of tar, sp. gr. 1·175, would a rectangular tank 30 ft. by 25 ft. by 8 ft. hold? [35.]

2. Some samples of coal tar contain considerable amounts of water and "free carbon." How do you account for this, and how does the presence of either of these bodies influence the operation of distillation? [40.]

3. Give a brief description of any modern type of fractionating column that has been used for refining crude products from tar, and explain the principle on which such columns are constructed. [35.]

4. What do you understand by the following: Medium soft pitch, 50's carbolic acid, 60's carbolic acid, 50-90's benzol, pure toluol? [35.]

5. Name and give the chemical formulæ of twelve of the most important chemical compounds which are known to occur in ordinary coal tar, and describe how you would prepare a pure specimen of any one of the above from crude tar. [40.]

6. Show how the following bodies are chemically related to one another and how they differ: Toluene, phenol, methylnaphthalene, anthracene. [45.]

7. Give a brief account of any two of the following processes: (*a*) The separation of pyridine from light oil, (*b*) the dehydration of crude coal tar, (*c*) the manufacture of solvent naphtha, (*d*) the manufacture of concentrated ammoniacal liquor, (*e*) the manufacture of "prepared" or "refined" tar. [40.]

8. Describe one of the new "direct" processes for the manufacture of sulphate of ammonia the details of which have been published. [35.]

9. How would you test any two of the following bodies to ascertain if they were of good commercial quality: (*a*) Sulphate of ammonia, (*b*) hot pressed naphthalene, (*c*) medium soft pitch, (*d*) prepared tar, (*e*) pale cresylic acid? [40.]

10. Give a short account of the chief impurities found in crude anthracene, and describe how they can be eliminated? [30.]

GAS-METER TESTING IN MANCHESTER.

High-Pressure Registration Apparatus.

In his report for the year ending March 31, which has been adopted by the Manchester City Justices, Mr. S. Dyson (the Inspector of Gas-Meters) states that the number of meters tested during the year was 43,682, showing a decrease of 4204 as compared with the previous year. The fees received amounted to £1696, being a decrease of £176; and the expenditure was £1964, showing a debit balance of £268. In all, 716 meters were rejected, or 1·86 per cent.; the percentage in wet meters being 2·24 per cent. The number of slot or prepayment meters tested was 23,053, or 55·06 of the total number of meters tested.

In the previous year's report, the Inspector mentioned that certain meter manufacturers had introduced meters for measuring high-pressure gas, which are fitted with differential gearing to compensate for any change in the density of the gas due to variation in the pressure in the mains used for the supply of high-pressure gas. Under the provisions of the Sale of Gas Act, 1859, it is pointed out, inspectors are required to test gas-meters at a pressure not exceeding ½ inch water-gauge for registration, and at 3 inches water gauge for soundness. Meters for measuring high-pressure gas are constructed for use at pressures varying from 50 inches to over 100 inches water-gauge, and the compensating indices in such meters are intended to regulate the measurement of gas passing through them. The statutory test of ½-inch pressure is inadequate and misleading where applied to this class of meter; and the official seal, if attached, is no guarantee of correctness under the high pressures for which they are intended. Inspectors have neither the appliances nor the authority to test gas-meters at these high pressures; and Mr. Dyson has therefore been reluctantly compelled to refuse to seal high-pressure gas-meters. The Gas-Meter Testing Committee have communicated with the Board of Trade on the subject; and the Inspector has attended at the offices in London, by request, to give his views in regard to the provisions required for the testing of such meters. The Committee have suggested that suitable apparatus be installed at the principal testing-stations in the kingdom where the meters for measuring high-pressure gas are likely to be presented in any number for stamping; and the matter is at present under consideration.

EDINBURGH AND LEITH GAS COMMISSIONERS.

Higher Rates for Coal Contracts—Increase in the Sale of Gas.

Various points arising out of the annual tenders were discussed at a meeting of the Edinburgh and Leith Coporations Gas Commissioners on Monday of last week—Provost MALCOLM SMITH presiding.

Bailie LINDSAY (Convener of the Works Committee) stated, in connection with the tenders for stores, that offers had been accepted, in the aggregate, for 200,000 tons of coal, which would be required from July 1 until the end of the year. The average price was 14s. per ton—being practically 2s. 1d. or 2s. 2d. rise as compared with the average price last year. Though 14s. was the average price, the tenders accepted included coal as high as 19s. and 20s. per ton.

Mr. PENNELL complained of what he described as a most unjust and

improper resolution of the Works Committee, not to consider any tenders by the offerers who last year declined to implement their tenders. As it happened, the result was that they were left, in one particular case at least, with only a single firm of tenderers for a certain important part of the material required for the Commission. He moved that the restriction referred to be deleted from the minutes.

There was no seconder to this motion, which accordingly dropped.

The TREASURER (Mr. A. Canning Williams) reported that the quantity of gas sold during the winter term of 1912-13 showed an increase over that for the corresponding period of 1911-12 of 15,945,100 cubic feet, or 2·32 per cent. The value of the gas sold amounted to £94,078, as compared with £92,674, an increase of £1404.

The report by the Engineer (Mr. Alexander Masterton) for the month of March showed that the gas made was 192,299,000 cubic feet, as compared with 171,572,000 cubic feet in the corresponding month of last year. The number of cookers fixed was 469, as compared with 256, making the total number on hire 14,018, against 9598 a year ago.

The minutes submitted to and approved by the Commissioners contained a report by the Engineer as to the staff of stair-light extinguishers taken over from the Edinburgh Corporation and employed by the Commissioners. Several accidents had taken place; and he foresaw that the Commissioners might be involved in heavy expenses in the event of serious mishap. Several of the men were becoming unable to overtake the work satisfactorily and within reasonable time; and with quicker and more energetic men the Commissioners would be saved from loss by overburning. One minute's extra burning per day meant a loss of £10 per annum; and as some of the men took fully half-an-hour more than others, in a year this mounted up to over £300. The Works Committee minuted that they considered the action of the Engineer in dismissing certain of the extinguishers had been taken in the best interests of the Commission, and that the matter should be left in his hands.

BLACKPOOL CORPORATION GAS UNDERTAKING.

Jubilee Report of the Engineer.

Mr. John Chew, the Gas Engineer and Manager of the Blackpool Corporation, has issued his fiftieth annual report to the Gas Committee. As a jubilee report, it is in the nature of a triumph so far as the profits of the undertaking are concerned. It shows that there is a net surplus of £12,219 in the year ended the 31st of March, which is £4079 more than the estimate. Had it not been for the advanced price of coal, the surplus would have been £18,500, and would thus have beaten the record, which was £18,021 in 1903. The surplus added to the profits in previous years makes a total of £321,000 which the works have yielded during the time Mr. Chew has been in charge of them, besides an accumulated sum of £95,000 applied in redemption of capital, amounting to £219,000. Mr. Chew points out the desirability of allocating to the renewal fund the increased surplus profit over the estimate, as extensive calls will be made on the fund in the autumn for repairs and for re-sheeting the oldest gasholders.

The business of the undertaking increased during the year; the revenue having been £103,729, as compared with £94,917 in the preceding year—an increase of £8812. The improvements and additions to the carbonizing plant are reported to be working satisfactorily, for, besides accounting for a decrease in the consumption of coal, £2200 less has been paid in wages for stoking. The income from residuals shows an improvement, for, though some lines found a drooping market on spot selling, others caught a rise caused temporarily by the great coal strike. The total sales amounted to £31,500, of which residuals to the value of £9000 were sent abroad, of £10,500 to other districts, and £12,000 came from local sales.

The year's make of gas reached 644½ million cubic feet—an increase of 55¾ millions over the preceding year. Additional cost was incurred in the distribution of gas in providing for a better supply for the coming season, and further works are in hand. Two miles of 8-inch high-pressure mains have been laid and brought into use; while the compressing plant is in position and awaiting connections. The new system of free labour maintenance to shop lighting has made a great improvement, and is much appreciated; and the advantages are to be extended to the general consumers.

The profit of £12,219 is after paying £11,257 for interest and sinking fund. The estimated profit for next year is £10,000.

ROCHDALE GAS PRICES.

From the annual abstract of accounts and estimates, prepared by Mr. S. Boothman, the Borough Treasurer of Rochdale, it appears that the profits on the gas, electricity, and tramways undertakings for the past financial year totalled £34,759, against which has to be set a water-works deficiency of £4832. Of the gas profits (which have reached the record figure of £23,654), the Council were asked to put £6000 to reserve, carry £1654 forward, and apply £16,000, the same amount as last year, to the rates. The electricity profit is £2882, of which £2000 is to go to the rates, and the balance to reserve. The total income of the gas undertaking, at £103,449, shows an advance of £5924—mainly owing to increased revenue from the sale of residual products. While sales of gas produced only £1031 more than in the preceding year, the amount realized by residuals was £4934 more. The expenditure increased by £2708. There is now in the sinking fund £65,301. The capital account totals £373,482; and £40,393 of loan money has been repaid.

At the meeting of the Town Council last Thursday, Mr. BLOMLEY said he wished to raise the question of a reduction in the price of gas. The Gas Committee had to consider what to do with the large profit of £23,654 on the trading account; and he believed the consumers of

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gas ought to receive some consideration. During the last twelve years, £132,000 had gone from the gas profits in relief of the rates; and he felt there were a large number of concerns the owners of which escaped paying their fair share of the rates on account of the considerable sum of money that went in this way from the gas undertaking. In addition to paying £132,000 towards the rates, the Committee had paid about £15,000 into the reserve fund. When the Manager submitted his estimate that £45,000 was required to put the plant in the condition he desired, two ideas presented themselves to his (the speaker's) mind—either that the Committee had been neglecting their duty by not meeting the lawful expenditure year by year, or else that they were providing over-liberally for a contingency that had not arisen. He thought the Committee were making a fatal mistake, because when they sought to carry out extensions at the gas-works there would be a Local Government Board inquiry, and they would be restricted, as some other boroughs were, in the amount they were allowed to hand over in relief of the rates. The price of gas in Rochdale compared very unfavourably with that in many neighbouring towns. Other boroughs found that lowering the price increased the consumption; and he thought they would find the same in Rochdale.

Mr. THOMAS supported Mr. Blomley's proposal. He said he heartily agreed with the idea of devoting £6000 a year to the reserve fund, and wished that the Council had acted on the advice of the Gas Committee years ago, and built up a strong fund. He thought an average profit of £10,000 a year should be enough. Certainly if they reduced the price of gas the consumption would be increased.

The MAYOR (Alderman Cunliffe) regretted that no notice of the subject had been given, in order that members of the Council might have been prepared for its discussion.

Mr. THOMAS asked whether it was proposed to seek borrowing powers from the Local Government Board for the £45,000 required for the expenditure at the gas-works.

Mr. WALKER replied that it was not proposed to go to the Local Government Board, but to take the money out of revenue. The £45,000 that would be required to meet large prospective expenditure would be spread over a shorter period than ten years. The Sub-Committee had already considered the first item of £20,000 for replacing the remainder of the horizontal retorts; and at the next meeting of the Council they would probably recommend the spending of £4500 on a new condenser, washer, and connections. Other items were £1000 for a new boiler and renewal of furnace tubes, and £4500 for the renewal of six purifiers and repairs to building; so that already they were committed to an outlay of nearly £30,000. The Committee asked the Council to agree to the proposal that £6000 should be carried to the reserve fund, and that a similar amount should be so treated annually.

The minutes which gave rise to the discussion were passed.

The Grange (in Barrowdale) Water Company, Limited, has been registered with a capital of £1000, in £10 shares.

GAS BYE-PRODUCT INDUSTRY OF JAPAN.

The "Journal of the Imperial Gas Association" of Japan dated March 25 opens with an article, by Setsusuke Inubushi, dealing with the above-named subject. He says that, in order to secure for the gas industry more prosperous conditions, an earnest effort to promote its bye-product industry must necessarily be regarded as the most important factor. Yet this work is still in an undeveloped state, and there remains ample room for further progress. In this respect, Japanese engineers have, he thinks, much to learn from those advanced countries where gas and its bye-products are in general use. Out of the operating gas undertakings in Japan (upwards of eighty in number) only eight are engaged in the bye-products industry; and from these the author selects the following for illustrating the extent of their work in the direction indicated.

Tokyo Gas Company.

Coke	tons	98,233·82	90 per cent. benzol	lbs.	18,684·50
Sulphate of ammonia	,,	599·21	Light oil	gals.	37,925·41
Coal tar pitch	,,	2,663·01	,, ,, No. 2	,,	33,182·65
Creosote oil (A)	gals.	69,829·67	Naphtha oil	,,	24,709·28
,, ,, (B)	,,	39,420·11	Refined naphthalene	lbs.	92,909·00
Refined coal tar	,,	119,445·39	Solvent naphtha	,,	19,285·00
Crude benzol	lbs.	87,517·00	Phenol	,,	10,222·00
3 per cent. benzol	,,	53,300·00			

Coal used, 111,303 tons; gas made, 1,431,248,600 cubic feet.

Osaka Gas Company.

Coke	tons	20,676·84
Naphthalene	,,	163 52
Carbon	,,	25·66
Sulphate of ammonia	,,	41·25
Pitch	,,	1246·74

Kyoto Gas Company.

Coke	tons	3792·29
Coal tar	koku	1575·99
Sulphate of ammonia	tons	37·81
Carbon	,,	11·23

Coal used, 5605 tons; gas made, 71,801,200 cubic feet.

Nagoya Gas Company.

Coke	tons	6040·09
Coal tar	koku	2841·29
Carbon	tons	7·13

Coal used, 8122 tons; gas made, 110,945,300 cubic feet.

Turning to the reason of the backwardness of the bye-product industry in Japan, the author attributes it to its comparatively recent introduction; whereas gas as an industry has existed in Europe and other countries for many years. The existing concerns in Japan have mostly been established within the past few years, with the result that some have not yet reached a sound financial condition. In addition to this, most of the gas undertakings are established in small provincial towns, except such as those at Tokyo, Osaka, Kyoto, Nagoya, and a few others. This has in turn a great bearing on the bye-product industry,

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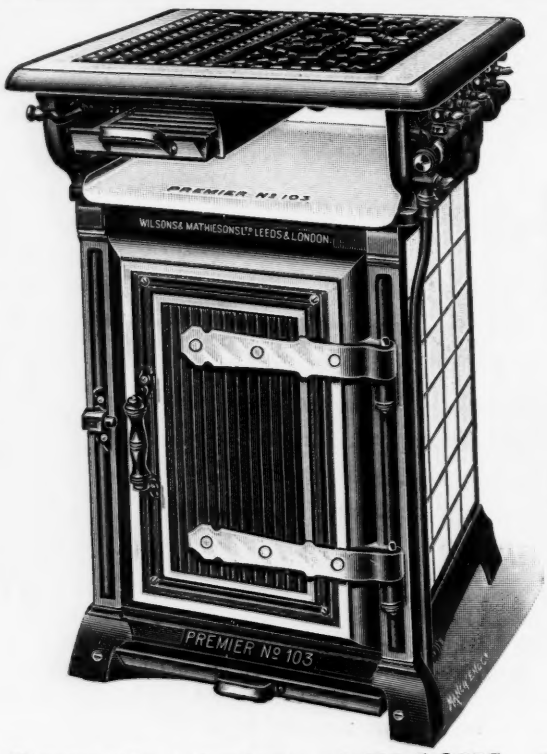

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because of the difficulty of carrying on the work with appreciable financial results.

"As it is," the author concludes, "our gas industry is now sailing, so to speak, in a favourable wind, which gives us the prospect of our provincial gas concerns expanding to a larger scale in years to come; giving them a facility and advantage in promoting the bye-product industry to better results and attainments. Furthermore, there is already a tendency among them to amalgamate, in order to carry on the undertaking on a larger scale—thereby realizing great profit and also advantage for both concerns and consumers. When such a prospect is fully realized, there will, no doubt, be an innovation in the bye-product industry, and a larger contribution to our industry in general will eventually be the result—thereby increasing our national as well as our individual wealth and welfare."

METROPOLITAN WATER BOARD.

The Financial Position.

At the meeting of the Metropolitan Water Board last Friday, the estimates for the financial year 1913-14 were presented.

Mr. A. H. Tozer, the Chairman of the Finance Committee, first dealt with the approximate result of the working for the year just closed. He said that a deficiency of £81,000 was anticipated; and though it was early to state what the precise result would be, so far as it was possible to forecast the figures the deficiency would be only about £72,000. Turning to the estimates for the current year, he said he had to deal with an estimated income of £2,949,700 and an expenditure of £3,046,930; showing an anticipated deficiency of £97,230. He remarked that the expansion of the Board's income was painfully slow; and the Board appeared to have travelled a long way from the halcyon days of the Water Companies, when, during the five years before their undertakings were acquired by the Board, there were average increases of £66,000 per annum. The probable cause of the falling-off was the outward movement of the population, which had caused a "slump" in the building of new houses within the Board's area. The total anticipated income of £2,949,700 compared with the approximate income of £2,933,940 obtained in 1912. On the expenditure side, the figures were somewhat disappointing, as they showed an increase of nearly £43,000. The increases anticipated included a large advance in the cost of coal. Dealing with the net results of the estimates, Mr. Tozer said the total expenditure exceeded that of the previous year by £40,913, and the total income showed an advance of £15,760; making an increase of £25,153 in the deficiency. The deficiency of £97,230 was larger than any yet experienced. For the first time it was greater than the sum set aside as a sinking fund, which was estimated at £83,089. The deficiency was represented by something less than ½d. in the pound, which was a very small contribution to be made by the general ratepayer for the communal benefits derived. On the question of the redemption of debt, Mr. Tozer said that £65,018 had been applied to the cancellation of stock, which raised the amount so cancelled to £301,594, which was purchased for a total sum of £264,948. The Board had thus been able to accelerate the redemption of debt by £36,646. It had to be remembered that no sum had been set aside in respect of the redemption of the acquisition debt, except such sums as had been provided by a surplus; and the days of surplus had been passed for the present. In about ten years' time, annual payments would have to be made for this object, and they would amount to about £140,000 a year. This sum would have to be provided by the ratepayers.

The Large Deficiency.

At the meeting of the London County Council last Tuesday, the Local Government, Records, and Museums Committee reported as follows: "We have for some time had under consideration, from the point of view of rating and local taxation, various questions arising out of the financial position of the Metropolitan Water Board and the proposals of the Board for dealing with the deficiency in the water fund. In connection therewith, we have considered the clause which the Board are seeking to insert in the Metropolitan Water Board (Various Powers) Bill, 1913, to remove any doubts as to the power of the Board to levy a rate to meet the accumulated deficiency in the water fund; and we have communicated our views on the subject to the Parliamentary Committee, who will, we understand, report to the Council on the Bill. We have also had before us certain demand notes for rates for the current half year on the Council's property, in which items have been included in respect of a contribution to the Metropolitan Water Board for deficiency rate. The Board early in the year notified to the rating authorities their intention to issue precepts to meet the deficiency, but subsequently (on April 4, 1913) decided to defer the issue of the precepts pending the above-mentioned application to Parliament. In the circumstances, and with the concurrence of the Finance Committee, we have decided to put these demands forward for payment." The report was received.

NOTES FROM SCOTLAND.

From Our Own Correspondents

Saturday.

Edinburgh.—The Edinburgh and Leith Gas Commissioners have accepted offers, amounting in all to 200,000 tons, of coal to be supplied from July 1 until June 30 of next year at an average price of 14s. per ton, which amounts to an increase of about 2s. 1d. per ton upon the average price paid last year. It was also intimated that the price for the supply of gas for public lighting in Edinburgh and Leith had been accepted at 2s. 3d. per 1000 cubic feet for the incandescent lighting, and 2s. 7d.

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for the flat-flame lighting. An experiment in high-pressure lighting is to take place in East Register Street, St. James Square, and in Little King Street, instead of at Waterloo Place as was formerly authorized.

One of the remarkable features of the situation created in Edinburgh as regards gas and electricity is that both are being more and more taken advantage of by the community. It is apparent that the full tide of their respective expansion has not yet been reached; and at the meeting of the Town Council on Tuesday there were references to the situation as it affected the Corporation. In the course of his annual review of the financial outlook for the incoming year, Mr. L. M'Leod, the Treasurer, mentioned that there was a decrease of £700 in the Lighting Department, which made the expenditure work out at £44,000. The wages bill was up £590; but this was counterbalanced by a saving of £1435 in the lighting of common stairs, owing to better terms having been arranged with the Gas Commissioners. In regard to electric lighting, Mr. M'Leod remarked that the estimated surplus was only £220, and that the policy of the Committee was to frame their estimates so as to come out practically square at the end of the year. The estimated revenue was £142,660, which was counterbalanced by expenditure of £80,265, and interest and sinking fund contribution of £62,175. Under this head, there would be noted the increase in the coal bill, which was estimated at £30,840 as against the actual cost in 1911-12 of £20,041. The revenue for the same year was £131,578; so that while the revenue had increased only 8 per cent., the coal bill had gone up 50 per cent. in the same period without any increased charge to the consumer. The Gas Commissioners, too, have had to pay very heavy advances in their coal contracts for the incoming year, and this also without any increase in the price of gas.

Dundee.—The Gas Committee of the Town Council have decided upon their contracts for coal for the ensuing year, amounting to 87,500 tons, at an average price of 16s. 1·23d. per ton. This is an increase of 1s. 5·57d. per ton on the average price at this time last year. This represents an increase cost of £5000. Mr. Alex. Yuill, the Gas Manager, stated that there had been an advance of 2d. per ton on the railway carriage for coal, and that there would have been a reduction in the price of gas if it had not been for the increased cost of coal, amounting to 5s. per ton in the last three years.

Fraserburgh.—At the monthly meeting of the Town Council held on Thursday, Mr. Campbell, the Gas Manager, recommended to the Gas Committee the purchase, for the coming year, of 3000 tons of coal at contract prices amounting to £3129, exclusive of any rise that might take place in the cost of freights. The increase will be about 2s. 5d. per ton when compared with last year's figures. The recommendation was adopted.

Helensburgh.—There was considerable discussion regarding the wages of the plumbers employed by the Town Council, at the meeting of that body, when Mr. Morton moved as follows: "That, as the Council have adopted the municipalization of the plumbing work at the gas-works, they adopt the same scale of charges and pay the same wages as local tradesmen." The motion, failed to find a seconder.

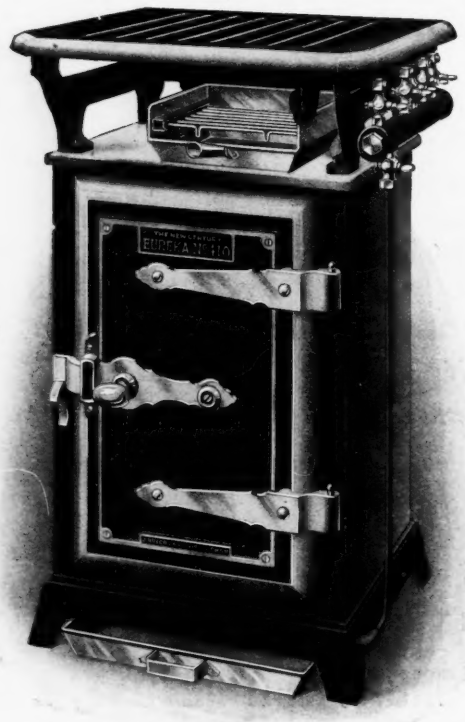
Lanarkshire.—The Water Bill for the Middle Ward District has been the subject of a provisional inquiry in the Parliament House, Edinburgh, during the week. The Order is promoted for the purpose of authorizing the District Committee of the Middle Ward of the county to construct water-works, to abandon the authorized Glengavel reservoir, and to extend the water supply limits of the Committee. The burgh of Motherwell asked that the inquiry be postponed, as they had a competing Order in hand, which would come up for examination in July; but, after considerable talk between Counsel and the Chairman, and an undertaking by Mr. Wilson, K.C., for the present promoters, Motherwell withdrew. The County Clerk, Mr. Thomas Munro, said that the population of the district had risen from 125,000 in 1891 to 183,000 at present, of whom 181,000 were supplied from this district. They wanted more water than the Glengavel scheme provided for; and such a supply had been found at Camps. If the Order were granted, it would settle the water supply question in Lanarkshire for forty or fifty years to come. Mr. Binnie gave engineering evidence on behalf of the promoters, and stated that to obtain the million gallons from Motherwell it would only stave off the evil day for a year or two. Mr. Hill said the scheme was a fine one, and everything was in its favour. Terms were proposed to the Gourock Rope-Works Company by the promoters which obviated their objections. The only question then was as to the amount to be sent down the stream during the ten years of construction; and it was fixed by the tribunal at the figure proposed by the promoters—namely, 2,500,000 gallons. Most of the clauses had been adjusted before the next hearing. Some talk ensued regarding the sporting rights; but the Commissioners inserted a clause that the only fishing or shooting to be permitted should be by the servants of the District Committee, who would be allowed to fish with a net to preserve the purity of the water. When the clauses had been adjusted, the Chairman intimated that the Commissioners had passed the preamble.

Larkhall.—At a special meeting of the Directors of the Larkhall Gas Company, Limited, on Wednesday, the offers for the supply of coal for the ensuing year were opened. The lowest offer showed an increase of 1s. 8d. per ton over last year's prices, which will cause an additional expenditure of £375 for the year. In view of the increase, it was found necessary to raise the price of gas to 2s. 11d. per 1000 cubic feet—an advance of 2d.

Paisley.—The average price of the coal contracts placed by the Paisley Town Council amounts to 14s. 8¼d. per ton, which is an advance of 1s. 8d. per ton over last year's figure, and a total additional cost of £4800. This price includes the 2d. per ton added to the rates by the railway companies. Coal has risen 3s. 8d. per ton in two years; but the price of gas is to remain the same—namely, 2s. 2d. per 1000 cubic feet to ordinary consumers.

Pitlochry.—At a meeting of the Local District Committee held on Thursday, it was agreed, on the motion of Mr. R. B. Mitchell, that a report be got as to the cost and method of procedure necessary to

GREAT BREAD-BAKING COMPETITION.



In the competition organized by the "*Evening News*" for the best Bread baked by London housewives, out of 4,000 loaves submitted that baked by Mrs. M. Rowe in a

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FIRST PRIZE.

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acquire the gas-works for the common good. Messrs. R. B. Mitchell and Mr. W. Fenton, along with the Clerk, were appointed to go into the matter.

Sanquhar.—The Town Council have decided to reduce the price of gas by 10d.—to 5s. per 1000 cubic feet. The Council have had the works under their direction for the last five years; and this is the first reduction they have been able to make in the price of gas. In view of the increased cost of coal, the concession now made is really much larger than the absolute reduction indicates.

St. Andrews.—A successful gas exhibition has just been held at the Christian Institute by the Parkinson Stove Company, Limited, of Birmingham and London, in conjunction with the Gas Company. Mr. Robert Hall, the Manager of the latter Company, spared no pains to make the exhibition full of interest; and he is to be congratulated on its general excellence and success. A splendid collection of gas appliances for cooking, heating, and hot-water supply was shown. An exhibition of lighting appliances by Messrs. W. Mackay and Co., of Glasgow, was included; and Miss E. M. Dods gave interesting and instructive cookery lectures to crowded and fashionable audiences each day.

Stirling.—The Gaslight Company are finding it necessary to increase the price of gas from 2s. 6d. to 2s. 8d. per 1000 cubic feet on and after Whitsunday, owing to the higher price they have to pay for coal.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 3.

Sulphate of Ammonia.

With the completion of the covering of contracts for April shipment, the weakness in the market for this article became more pronounced, and prices have fallen rather rapidly during the last few days. Direct buyers have been largely pursuing a hand-to-mouth policy, and dealers have shown no eagerness to make purchases. Consequently the supply has been greater than the demand, and values have now declined to £13 6s. 3d. per ton f.o.b. Hull, £13 7s. 6d. per ton f.o.b. Liverpool, and £13 8s. 9d. per ton f.o.b. Leith. In the forward position some makers have reduced their quotations to £13 10s. per ton f.o.b. shipping port, without finding buyers at that figure; while second-hand sellers are reported to have been offering at 2s. 6d. per ton less money.

Nitrate of Soda.

The tone of this market has also been weak, and the spot prices have been reduced to 11s. 3d. per cwt. for ordinary and 11s. 4½d. for refined quality.

LONDON, *May* 5.

Tar Products.

Business in tar products is quiet; but on the whole prices remain fairly steady. There is really nothing fresh to report in pitch. Sales are difficult to negotiate, and consumers are unwilling to pay present prices. Ninety per cent. benzol is still firm, and the inquiry is good for both prompt and forward delivery. Solvent naphtha is quiet. Heavy naphtha is in fair demand, but is having no effect on the price. Crude carbolic appears to have steadied somewhat; and in one or two quarters slightly better figures have been paid during the past few days. Creosote is fairly firm, especially in London. The price is unaltered.

The average values during the week were: Tar, 29s. 6d. to 33s. 6d. Pitch, London, 47s. to 47s. 6d.; east coast, 46s. 6d. to 47s.; west coast, Manchester, 46s. to 46s. 6d.; Liverpool, 46s. 6d. to 47s.; Clyde, 46s. 6d. to 47s. Benzol, 90 per cent., naked, London, 1s. 0½d. to 1s. 1d.; North 1s. to 1s. 0½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 11d. to 11½d.; North, 10½d. to 11d. Crude naphtha, in bulk, London, 5½d. to 6d.; North, 5d. to 5½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d.; North, 11½d. to 1s. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3¼d. to 3⅜d.; North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 5d. to 1s. 5½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is decidedly weak, and a large amount has been put on the market for tender during the past week. There has been a decided drop in the price, and consumers both at home and abroad are not willing to buy for the forward position even at a reduction. Outside London makes are quoted at £12 15s. to £12 16s. 3d.; Leith, £13 12s. 6d.; Hull, £13 8s. 9d. to £13 10s.; Liverpool, £13 10s. to £13 11s. 3d.; Middlesbrough, £13 8s. 9d.

Manchester District Tar Prices.

It is officially announced that the average price realized for March deliveries of tar in the Manchester district—based on the value of the products—was 40s. 4d. per ton.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a strong demand for coal. Some of the collieries appear to be behindhand in their deliveries; and this helps to the strength of the market. In steam coals, best Northumbrians are steady at about 16s. 9d. to 17s. per ton f.o.b. Second-class steams are unaltered at near 14s. 6d. per ton; and steam smalls are again firm at 11s. to 12s. 3d. per ton f.o.b. The strike in the Silesian coalfield has thrown a little demand into this market, but not to the extent that had been looked for. In the gas coal trade, the inquiry is good, though the consumption is naturally lower at this season. Best Durham gas coals

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are rather scarce at 16s. per ton f.o.b.; while second-class gas coals are steady at from 15s. 3d. to 15s. 4½d. "Wear specials" are about 16s. 3d. per ton f.o.b. The contracts for the Newcastle and Gateshead Gas Company are now in the market. These are the most important local contracts—for about 300,000 tons yearly; and they will show the tendency of the trade. The price has fluctuated a good deal in recent years. In 1908, the Company paid no less than £174,800 for their coal; in 1911, for a similar quantity, £150,000, with an advance for the past year that is said to have been "nearly" 2s. per ton; and this is expected in some measure to be followed by a further advance now. It will be, however, a few days before actual figures are available. Gas coke is very steady. The production is less at this season; and the price is firm as last quoted.

Scotch Coal Trade.

Throughout Scotland the coal trade remained practically unchanged during the past week. The demand for all classes was unabated in volume; and prices ruled steady. On the Glasgow Coal Exchange on Friday, the following were the approximate prices quoted: Steam coal, 13s. 6d. to 14s.; splint, 14s. 9d. to 15s. 3d.; ell, 13s. 9d. to 14s. 3d.; trebles and doubles, 13s. 3d. to 13s. 9d.; and singles, 13s. 3d. to 13s. 6d., f.o.b. Glasgow.

West Bromwich Gas Undertaking.

In a report issued on Saturday, the West Bromwich Gas Committee state that the Local Government Board have sanctioned the borrowing, for the installation of two settings of vertical retorts, of £3740, repayable, with interest, within a period not exceeding twelve years. The sales of gas during the financial year ending March 31 were 359,297,687 cubic feet—an increase of 17,419,713 feet on the previous year. The amount of gas rental was £41,643, or an increase of £445. Owing to a public demand, the Committee have decided to extend the present high-pressure gas-main for a distance of half-a-mile.

The Welsbach Light Company, Limited, of Gray's Inn Road, forward us a copy of a catalogue which they have just issued, dealing entirely with Pharos-Welsbach high-pressure gas lighting. In addition to giving illustrations and details of the Welsbach-Bryan Donkin compressors (of which the Welsbach Light Company are the sole selling agents for lighting purposes in the United Kingdom), the booklet furnishes prices and particulars of the more popular Pharos lamps; and a noteworthy feature is the reproduction of a series of photographs of installations carried out on this system of high-pressure lighting. The Company also enclose a reprint of a statement by Mr. J. C. van Gothem (Chief Engineer to the Company), dealing with the Manchester street lighting tests, and setting forth the results attained by Pharos high-pressure gas-lamps as compared with those with flame-arc lamps.

City of Santos Improvements Company.

Presiding at the thirty-second annual meeting of the Company, which was held at River Plate House, E.C., on Monday of last week, Mr. D. M. Fox said that never before had the Directors had to submit so encouraging a statement, not only as regarded the present, but looking forward to the future. The population of the city and suburbs, which was in 1880 estimated at 12,000, was now from 70,000 to 80,000. In the same period, the number of houses supplied with water had risen from about 120 to 5720; while the number of public gas-lamps had gone up from 383 to 1400, and the private gas consumers from 140 to 2625. The total gas consumption in 1880 was 4 million cubic feet; and it now amounted to about 85 millions. The effect of the wonderful expansion experienced had naturally been to correspondingly enlarge the scope of the Company's operations, which now consisted of several distinct undertakings—controlling gas supply, water supply, and electric light, tramways and power, &c. The capital had from time to time been increased to tenfold what it was at the formation of the Company in 1880; and with each increase the earning power and financial stability of the concern had been proportionately strengthened. Since 1900, dividends of 7 per cent. per annum had been regularly paid on the ordinary shares. Gas had held its own, in spite of the advent of electric lighting. The General Manager (Mr. Bernard F. Browne) had done much to improve the lighting of the city and to popularize the use of gas for all purposes. As to water-works, the building of new houses necessitated the distribution of water over wider areas, and at points more distant from the service reservoirs; and additional large mains were in consequence being laid down. During the year, 216 more houses had been connected with the service; and the demand for supply to private consumers and industrial undertakings was steadily increasing. The relations with the Government and the Municipalities continued to be of a most cordial nature. He concluded by expressing the high appreciation of the Board of the services rendered by Mr. Browne, who, in his annual report, paid generous tribute to the engineers and other officers and employees of the Company. A final dividend upon the ordinary share capital of 4 per cent., less income-tax, was declared (making 7½ per cent. for the year).

Llandrindod Wells Gas Company.—In moving the adoption of the report and accounts, at the sixth annual meeting of this Company last week, the Chairman (Mr. Charles Hunt) referred to the continued progress of the Company's business—50 new consumers, and an increase in gas sales of 689,000 cubic feet. The unfavourable weather during the holiday season seriously affected the consumption, as the peak of the load at Llandrindod Wells occurs in the month of August, and the minimum consumption during the months of December and January. The profit was not sufficient to justify the Directors recommending the payment of any dividend, although a small one had been fairly earned.

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THE SOUTH MANCHURIAN RAILWAY CO.'S NEW HOTEL,

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Gas and Water Arrears at Pontefract.—As the result of an investigation at Pontefract, in connection with allegations as to the muddled and backward state of the books of the Corporation, an official list has been published of persons and public bodies in arrear with the payment of gas and water accounts, showing the amounts outstanding at March 31 last. The investigation Committee found that the total arrears were £2743; and in this connection it has to be remembered that a penny rate in the borough only realizes a little over £200. Of the sum named, £1407 has been owing for periods varying from twelve months to five years. The gas arrears list contains 155 names, and amounts to £1275; while the water-rate arrears list comprises 167 names, representing £397.

Birmingham Gas Profits and the Rates.—The accounts of the department for the past financial year were considered and approved at a meeting last week of the Birmingham Gas Committee. Questioned at the close of the proceedings, the Chairman (Alderman Sir Hallewell Rogers) said the amount the Committee proposed to hand over to the Finance Committee in aid of the improvement rate would be lower by some few thousand pounds than last year, when the sum given was £80,681. He pointed out that it must be borne in mind that during the past year the coal strike had taken place, and increased prices had to be paid for coal and oil. Moreover, the full effect of the reduced prices to the consumers had been felt, and had benefited the consumer to the extent of over £70,000, as compared with the previous twelve months. In addition to this, two Easters had occurred in the financial year, which made a considerable difference in the sale of gas without a corresponding diminution in the expenses.

Messrs. John Wright and Co. have just received an order for nine of their "Hotwell" automatic low-pressure boilers for use for researches and tests in physics, &c., in the National Physical Laboratory at Teddington. This boiler was selected from the various gas-heated boilers submitted.

The Davis Gas-Stove Company, Limited, have issued their gas-cooker booklet for the present season. It shows how "the campaign against the coal-scuttle" may be carried on; and it has an artistic cover printed in colours, illustrating its title—"Summer Comfort."

The Clay Cross Gas Company, Limited, has been registered with a capital of £55,000, in £1 shares, to acquire the undertaking authorized by the Clay Cross Gas Orders of 1902 and 1911; to manufacture, sell, and supply gas and its residual products; and to adopt an agreement with the Clay Cross Company, Limited. The Directors are to be the same as shall for the time being, and from time to time, be Directors of the Clay Cross Company, Limited.

The extraordinary sight of a wide stream of liquid tar was witnessed at the yard of the Batley Gas-Works a few days ago, when the valve of a tank which was receiving tar for removal to the chemical manufacturers was broken, and the tar, of which the tank was nearly full, flooded the yard to a width of 20 yards, and ran out of the gates into the street. The stream could not be stopped until the tank was empty. Before anything further could be done, the yard had to be covered with ashes; and, later, these and the tar were scraped up by a gang of men.

The Standard of Empire Supplement to the "Standard" last Thursday contained a brief sketch of the history of the firm of Messrs. William Coward and Co., Limited, of Bishopsgate, E.C., and an appreciative reference to their work in connection with the developments which have taken place in Australia and New Zealand since they began to attract attention. In the early days of Sydney's growth, Messrs. Coward were associated with the installation of its gas lighting; and many important towns in the Commonwealth owe their progress in this particular to the firm's enterprise. They have represented the Australian Gaslight Company of Sydney since its formation in the year of the accession of the late Queen Victoria; and they have successfully carried out the supply of the extensive modern installations lately undertaken by this and other Commonwealth companies.

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange has had but a poor week—or rather two unequal parts of a week, for a large slice was taken out of the middle of it by the usual closing on May Day. But it was not much loss, for the general tendency nearly all the time was far from cheerful. Day after day came and went without revealing a glimpse of a Montenegrin settlement; uneasiness prevailed regarding the prospect of labour troubles at home; and in various quarters of the globe were factors which might make mischief. It goes, therefore, almost without saying that markets had to give way; but happily there was no internal trouble, and the decline was not heavy when all is considered. The opening on Monday was dull and languid; apprehension as to the Eastern difficulty being oppressive. The tone was weak all round. Government issues drooped, and Consols receded ⅛. Rails got no support and gave way, and Americans were in poor case. At the start on Tuesday things tried to look up, and prices were beginning to mend; but before long the position was upset by grave rumours as to Montenegrin matters. Promptly everything gave way. Consols fell another ⅛; and all the leading markets were similarly hit. Wednesday opened with hesitation; but the general outlook was too sombre to bear up against. Consols shed another ⅛, Rails made a brave attempt to stand fast, but sellers were too strong for them, and Americans were very weak. The re-opening on Friday was most quiet, and business was never brisk at any time; but the tone was distinctly better, with a general disposition to descry some ray of light through all the clouds on the political horizon. Prices improved. Consols regained ⅛, Rails made moderate advances, and even Americans were better. But Saturday lost all the cheerfulness, and markets in general were less firm. Consols, however, did not move, and closed without further change at 74⅜ to 74⅞—a loss of ⅛ in the week. In the Money Market, rates hardened steadily up till the end of the month, after which they became easier. Business in the Gas Market was rather more active than the week before, and was somewhat more evenly distributed. The general tone was quite satisfactory, and several issues made advances in quotation as against only a few retrogressions. In Gaslight and Coke issues, the ordinary was in good demand at rather higher figures, changing hands at 102½ to 103½—a rise of ½. In the secured issues, the maximum realized 81, the preference 95¼ to 97½ (a fall of ½), and the debenture 73⅜ to 74⅝. South Metropolitan was little dealt in, and prices were easier, ranging from 110 to 111½—a fall of 1. The debenture was dealt in at 74. Nothing was done in Commercials, though the price of each capital issue was put up a point. Among the Suburban and Provincial group, Brentford old was marked at 265, Brighton original at 209¾ and 210½, ditto ordinary at 151 and 152½, British at 45¾ to 45⅞, South Suburban at 118, and, on the local Exchange, Liverpool "A" at 212—a fall of 1. In the Continental companies, Imperial made 173½, Union 83½, ditto preference 130½ and 131½, and European 17⅞. Among the undertakings of the remoter world, Melbourne fetched 99, Monte Video 12¾, Primitiva 6½ to 6 11/16 (a fall of ⅛), ditto preference 4 15/16 to 5 1/32, San Paulo preference 11¼.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 11	5	Alliance & Dublin Ord.	73—76	..	6 11 7
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	84—87	..	4 12 0
280,000	5	April 11	7½	Bombay, Ltd.	6¾—6⅞	..	5 11 1
50,000	10	Feb. 27	15	Bourne-mouth Gas and Water } 10 p.c.	28½—29½	..	5 1 8
332,000	10	,,	7	Do. B 7 p.c.	15½—16½	..	4 6 8
75,000	10	,,	6	Do. Pref. 6 p.c.	13½—14½	..	4 4 3
380,000	Stk.	Feb. 27	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	200—205	..	5 7 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	206—211	..	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.	151—154	..	5 3 11
530,000	20	Mar. 28	12½	British	45—46	..	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	89—91	..	4 7 11
245,771	Stk.		4	Buenos Ayres 4 p.c. Deb.	91½—93½	..	4 5 7
100,000	10	,,	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	109½—111½	+½	4 9 8
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	105—107	+1	5 2 1
560,000	,,	,,	5½	Do. 3½ p.c. do.	102—104	+1	5 2 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	83—86	..	4 13 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—132	..	5 6 1
492,270	Stk.	—	5½	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.	17½—18½	..	5 8 1
16,415,840	Stk.	Feb. 13	4/17/4	Gas-light and Coke } 4 p.c. Ord.	102—104	+½	4 13 9
2,600,000	,,	,,	3½	3½ p.c. max.	80—83	..	4 4 4
4,062,235	,,	,,	4	4 p.c. Con. Pref.	95⅛—97⅛	−½	4 2 1
4,674,850	,,	Dec. 12	3	Coke 3 p.c. Con. Deb.	73—75	..	4 0 0
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.	89—91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	April 25	11	Hongkong & China, Ltd.	16½—17*	..	6 9 5
131,000	Stk.	Mar. 13	7⅜	Ilford A and C	153—155	..	4 18 4
65,780	,,	,,	6½	Do. B	120—122	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,000	Stk.	Nov. 14	9	Imperial Continental	172—175	..	5 2 10
1,335,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	85—87	..	4 0 6
200,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.	120—123	..	4 17 7
561,000	Stk.	Feb. 27	10	Liverpool United A	212—214	−1	4 13 6
718,100	,,	,,	7	Do. B	151—153	..	4 11 6
306,083	,,	Dec. 30	4	Do. Deb. Stk.	98—100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.	68—70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean	4¼—5	+⅛	6 0 0
250,000	100	April 1	4½	Met. of Melbourne } 4½ p.c. Deb.	98—100	..	4 10 0
541,920	20	Oct. 30	3½	Monte Video, Ltd.	12¾—13½	..	5 5 8
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.	98½—99½	..	4 10 6
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	85—86	..	4 1 5
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.	13—14	..	5 4 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	127—132	..	6 1 3
60,000	5	Mar. 28	10	Ottoman, Ltd.	8—8½	..	5 17 8
60,000	50	Feb. 27	13	Portsea, Island B	125—128	..	5 1 7
100,000	50	,,	12	Do. C	122—125	..	4 16 0
249,980	5	Oct. 11	8	Primitiva Ord.	6½—7	−⅛	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	4 15/16—5 1/32	..	4 16 5
521,600	100	Dec. 2	4	,, 4 p.c. Deb.	95—97	..	4 1 8
846,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	92—94	..	4 5 1
275,000	5	Apl. 11	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	11¼—11⅝	..	5 2 2
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mar. 13	10	Sheffield A	225—227	+1	4 8 1
209,984	,,	,,	10	Do. B	225—227	+2	4 8 1
523,500	,,	,,	10	Do. C	225—227	+1	4 8 1
90,000	10	Sept. 27	7½	South African	10—11	..	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.	110—112	−1	4 17 7
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	73—75	..	4 0 0
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.	161—163	..	5 4 4
952,795	Stk.	Feb. 27	5	S'th Suburb'n Ord. 5 p.c.	117—119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	115—117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	117—119	..	4 4 0
594,740	Stk.	Nov. 14	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham and } A 5 p.c.	139—142	..	5 2 1
483,940	,,	,,	5¾	B 3½ p.c.	115—117	..	4 18 3
149,470	,,	Dec. 30	4	Edmonton 4 p.c. Deb.	92—94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.	115—116	..	4 6 2
255,636	Stk.	Mar. 13	6⅞	Wands-worth B 3½ p.c.	137—140	..	4 18 2
88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	68—70	..	4 5 9

Prices Marked * are "Ex. Div."

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

WATER ENGINEER. Sheffield Water Department. Applications by May 15.
CANVASSER. No. 5731.
FOREMAN (STOVE REPAIRING SHOP). No. 5728.

Appointments, &c., Wanted.

LEADBURNER. No. 5715.
MANAGER OR REPRESENTATIVE (High or Low Pressure Lighting, &c. S. Haynes, Nottingham.

Plant, &c. (Second-Hand), For Sale.

GASHOLDER. Cambridge Gas Company.
GASHOLDER AND TANK. Fraserburgh Gas-Works.

Patent Licences, &c.

MANTLES. W. G. Potter, 45, Monsell Road, Finsbury Park, N.
MANUFACTURE OF LIQUID ILLUMINATING GAS. D. 9564, c/o Daube and Co., Berlin.
WASHING AND COOLING GAS. Cruikshank and Fairweather, 65-66, Chancery Lane, W.C.

Stocks and Shares.

CANNOCK, &c., GAS COMPANY. By Tender. May 19.
SOUTHEND WATER COMPANY. London Mart. May 20.
SWANSEA GASLIGHT COMPANY. By Auction. Hotel Metropole, Swansea. May 6.

Stocks and Shares—(*Continued*).

WANDSWORTH, &c., GAS COMPANY. London Mart. May 20.
WEST'S GAS IMPROVEMENT COMPANY. No. 5730.

TENDERS FOR

Benzol.

WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Bye-Products.

WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Coal.

BARROW CORPORATION. Tenders by May 30.
BRIDGNORTH GAS DEPARTMENT. Tenders by May 17.
HEYWOOD GAS DEPARTMENT. Tenders by May 11.
LEIGH (LANCS.) GAS AND WATER DEPARTMENT. Tenders by May 17.
MANSFIELD GAS DEPARTMENT. Tenders by May 21.
ROCHESTER, &c., GAS COMPANY. Tenders by May 21.
WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Coke.

HUDDERSFIELD GAS DEPARTMENT. Tenders by May 10.

Cookers, Fires, &c.

WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Fire Clay Goods.

WARRINGTON GAS DEPARTMENT. Tenders by May 21.

General Stores (Glass, Iron and Steel, Lead Piping, Flexible Tube, Vitriol, Drysaltery, Lime, Cement, Ironmongery, Castings, Oils and Paints, Taps and Valves, Bricks, &c.).

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 17.
MANSFIELD GAS DEPARTMENT. Tenders by May 21.
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Lamps, Gas-Fittings, &c.

WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Meters.

WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Oxide (Spent). No. 5729.

Pipes, &c.

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 17.
WARRINGTON GAS DEPARTMENT. Tenders by May 21.

Tar and Liquor.

MANSFIELD GAS DEPARTMENT. Tenders by May 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

WHITSUNTIDE HOLIDAY.

In consequence of the WHITSUNTIDE HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

NOT LATER than the FIRST POST ON SATURDAY.

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See Illustrated Advertisement, April 8, p. 71.

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BEFORE Purchasing your 1913 Cycle, kindly send post-card for our CATALOGUE. Cash or gradual Payments. Speciality, Slot-Meter Copper Collector. MELROSE CYCLE CO., COVENTRY.

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JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXII., No. 2609.] TUESDAY, MAY 13, 1913. [65TH YEAR.

EDITORIAL NOTES.

An Unwarranted Attack on Continuous Verticals.

AN article obviously inspired for the purpose of setting German opinion against the Woodall-Duckham continuous vertical retort system has appeared in the "Journal für "Gasbeleuchtung;" and we are not a little surprised that our contemporary has admitted to its columns a statement containing so much innuendo, misrepresentation, and omission, when every detail of the story was open to verification. It is distasteful to us to have to refer to the matter at all; but it is more distasteful to find an attempt being made, in the opprobrious fashion running through the article in our German contemporary, to gain commercial favour for one system by an effort to unfairly damage the performances of another. In the first and last part of the article, there are unworthy imputations regarding the publication of the results obtained in the working of the Woodall-Duckham settings at Lausanne. It is in the first place stated that the early results realized, which were extremely favourable to the system, could not be maintained. At the end of the article, it is asserted that the system requires far more careful attention in every respect than intermittent retorts; and the readers of the article are therefore advised to regard at least with suspicion articles that are written in exaggeratedly glowing terms, and results of experiments which cannot be checked, and which are not free from error. If they cannot be checked, it is difficult to see how anyone can judge that they are not free from error. But that is a comparatively small point.

The more serious one is that this is an attack, and, we say this deliberately, a mean attack, on the *bona fides* of several people whose reputation is as important to them as is that—perhaps more so—of the anonymous person or persons responsible for the article in question. Involved in the charge is the engineer at Lausanne, the several engineers who have been to Lausanne to inspect the system in operation and the records of the working results, and last but not least the contractors for the settings, who have a great deal at stake, and who can in the end gain nothing by publishing erroneous information. There were figures published at the Glasgow meeting in June, 1911, of the Institution of Gas Engineers. Mr. J. P. Leather was one who then gave figures. Where did he get them from? From the actual working records at Lausanne, after spending some time there investigating the system. Anybody who knows Mr. Leather is not going to be convinced, by anyone interested in any system of carbonization, that he would knowingly mislead, or that he would be easily misled. Since that time, other results have seen the light of day from working tests made with various coals—with German coal among others—at Lausanne; and the figures have all been consistently good. The advice to treat with suspicion the results is an insinuation against the good faith of those responsible for test and working figures and for their publication; and we look upon this as one of the worst features of the article in our German contemporary. The character of the article, we feel sure, all our German engineering readers who have perused it will condemn as being in bad taste and an affront to fair-play.

In the second place, the tenor of the article suggests that something went seriously wrong with the Lausanne installation, that there have been all sorts of troubles, and that in consequence the first retorts put in are now being replaced, and that the English contractors for the system have, in their own interests, gone a long way in meeting the Lausanne authorities in this matter. The troubles that are spoken of are purely imaginary on the part of the person or persons responsible for communicating the article or the information that is so patently intended to defame the Woodall-Duckham system in the eyes of German gas engineers. A specimen of the shallowness of the absurd charges is sufficiently seen by reference to one single point, without troubling to traverse them all. As our readers are aware, the openings of the coke chambers at the bottom of the Woodall-Duckham retorts are water-sealed; but it is supposed that in the Lausanne settings air entered here, and, helped by the vacuum conditions, the gas contained some 8 per cent. or more of nitrogen. We have not troubled to verify this figure. But supposing it to be true, what point is there in it compared with intermittent working. The analysis, published last week (p. 404) by Mr. R. Nelson, of East Hull, of the gas produced by his Dessau retorts, shows 7·76 per cent. of nitrogen, and some of the nitrogen figures published by Mr. C. Dru Drury in his 1911 Institution paper ran to between 7 and 8 per cent.—this, too, with Dessau plant. This is very interesting, because it is declared, in the article in our German contemporary, that a "high" percentage of nitrogen is proof of leaky conditions; and evidently the writer of that article regards 8 per cent. as high! But another important part of the allegation is that the retorts are being changed, and that the English contractors, in their own interests, went a long way to meet the Lausanne authorities in this matter. The first part of this is true; the second part is untrue. The retorts are being changed at the request, and at the expense, of the Lausanne authorities—not because of the imaginary troubles that are found protruding, with spiteful appearance and intent, from the article in our contemporary, but because the section of the retorts first put in, while suitable for many classes of coal, was not suitable for dusty French coals, and economic reasons alone were responsible for the change that is being made from the old-type section of retort to the newer Woodall-Duckham chamber retort, which will deal with any class of coal, and which is to-day used in all work on this system. That is the whole explanation.

The weakness of this attack for obviously interested motives is that Lausanne is not the only seat of experience with the Woodall-Duckham system. But the article does not say so, nor does it say whether the supposititious experience of Lausanne is confirmed elsewhere. Possibly other engineers who publish figures concerning the Woodall-Duckham system would also be roped-in with those who are already regarded as suspect by the author or authors of the article in our German contemporary. And probably, too, the same author or authors, in the free and easy manner in which he or they misrepresent things on insufficient evidence, would be equally prepared to question the competence of those engineers who have selected the Woodall-Duckham system for considerable installations, and certain of whom, on their satisfactory experience, are arranging for extensions. We do feel that an attempt has been made, in a very unfair and paltry manner, to sully the reputation of the system among German engineers. They will recognize this, and pertinently ask, Why the attempt?

The Fuel Account.

NEARLY two years ago, Mr. E. Körting called attention to the need of more consideration being given to the fuel account in carbonizing operations; and in these days of high-priced coal, and therefore of good prices for coke, the question is one of great importance—the higher the sale price of coke, the more financially important becomes a low fuel account consistent with heating efficiency. Suppose a works is carbonizing 50,000 tons of coal per annum. The difference between a fuel account of 10 per cent. (this is low, but it is closely approached at several works) and 16 per cent. would represent a considerable additional amount of coke for sale, and in these days an extra good round figure on the receipts side of the revenue account. It was partly the commercial aspect of this question of fuel economy, combined with heating efficiency, to which Mr. Körting drew attention in the article that we have in mind. The question comes up again through the discussion, at the meeting of the North of England Gas Managers' Association, on Mr. R. Nelson's

paper, as reported last week on pp. 405-7; for some of the fuel percentages then named were as wide asunder as those we have already quoted. The figures mentioned, we take it, may be relied upon as actual ones. But in the old days, the rugged modes of estimating fuel accounts—by, for instance, calculating a fixed production of coke per ton of coal, deducting from this the sales, and describing the difference as the consumption for fuel purposes, with consequent large variations in the percentage figures as between works and works, though practically the same settings and the same coal were in use—have caused a little lingering suspicion regarding fuel figures generally, unless there is information available showing that they are fairly reliable. The cooling of the coke discharged from continuous vertical retorts, without the use of water, has brought about conditions which enable, in their case, a very correct measurement to be made of the fuel account; and the information, in view of the high-class character of the productive work, is extremely interesting. Such accurate information cannot be obtained in carbonizing systems where the coke is transferred direct from the retorts into the producers, nor where a high percentage of quenching water remains in the coke where cold coke is used for producer feeding. Besides, in comparisons, all sorts of other conditions intervene to produce inequality. Differences of temperature, differences in the work done by retorts, differences in the gas production, differences in the quality of the coal from which the coke is produced, all contribute to setting up variations of condition that interfere with strict comparisons.

However, the percentage fuel figures that we have before us from modern carbonization systems may be taken as broadly comparable; and they show considerable differences. In view of the quantities and the values the differences represent, it would be of interest if those who have had long experience of any system the higher fuel account of which is not disputed would indicate the advantages that may be credited to the extra fuel consumption, and how these advantages arise, in comparison with other modern systems the gas production of which per ton of coal is on similar lines. With the old style system of Dessau verticals, Mr. C. Dru Drury found at Sunderland that, with Durham coal, the fuel account worked out to 17·8 per cent. of the coal carbonized. Now the retorts in the new-style settings are arranged eighteen in a bed; and, under this form of construction, we believe Mr. Körting found that his fuel account was about 11½ per cent., or (say) 12½ per cent. including all incidentals, such as lighting up, standing off for scurfing, and so on. But we come to Mr. Nelson's paper of twelve months since, upon the Dessau settings at East Hull constructed on the latest system of eighteen to the bed. He then told those who heard and read his paper that the fuel account was 16 per cent.; and we made reference to this at the time. Now he informs us that he has found it impossible to reduce the fuel below 16 per cent. It must be remembered that the charges are twelve-hour ones, with two-hours' steaming; and, of course, water gas production cannot go on in the retorts without making some impression upon the proportion of coke make charged-up as fuel. In the discussion last Saturday week, Mr. Drury and Mr. T. Hardie were quite complimentary over Mr. Nelson's fuel account, considering his total production of gas; while Mr. H. H. Collett was not altogether pleased with the result. Advantages cannot be obtained without some cost. What, therefore, would be of technical interest would be to ascertain why it is that there is this difference between Mr. Nelson's figure, and what we quite understood some time ago was the figure realized by Mr. Körting at Berlin.

In the course of the discussion on Mr. Nelson's paper, Mr. J. C. Belton spoke of a 10 per cent. fuel account with his horizontal settings; and we know of cases where, with continuous verticals, the fuel account—checked by actual weighings—has been in proximity to 10 per cent. If we now compare this percentage with the 11½ to 12½ per cent. spoken of by Mr. Körting for Dessau intermittents on the modern system of construction, there is a difference of about 2 per cent.; and this 2 per cent. is fully accounted for by the retention and utilization, in the continuous vertical settings, of a proportion of the heat of the spent charge. Mr. Thomas Glover, of Norwich, has, by tests, calculated that the considerable extraction of the heat from the spent charge, and its utilization within the settings, represent about 2 per cent. of fuel. This would account for the difference between the figure given by Mr. Körting and that for the continuous retort-settings fortunate in a low-fuel consumption. But what would be instructive is to find out why there should be the 4 per cent. higher consumption in the case of the East Hull settings than the 12 per cent. (to take the mean figure) referred to by Mr. Körting. The point is one of interest; but, of course, the fuel account cannot be taken alone as the test of the efficiency of a carbonizing system.

Gas-Pipes from Abroad.

Over the telephone and by other means of communication, there occasionally reach us inquiries for the addresses of Continental pipemakers. It is not our business to ask why those addresses are needed; but we can make a shrewd guess. Now there comes for publication, the following announcement: "The British Gaslight Company, Limited, " have accepted the tender of the Société Anonyme des " Hauts-Fourneaux et Fonderies, at Pont-a-Mousson, for " the supply of some cast-iron pipes required at their Hull " works; the quotation of the French Company having " been the lowest received." Sir Corbet Woodall is one of the Directors of the British Gas Company; and we have only to carry our memories back a few weeks to the time when Sir Corbet, as President of the Society of British Gas Industries, and as a gas administrator with large experience of the buying and selling operations of the gas industry, used the opportunity of an address to deprecate those vicious trade alliances that stamp-out competition and strangle the protection of home consumers in obtaining their goods and necessaries at the cheapest rates. But if there are such alliances, no objection can be raised by those indulging in them to their customers looking elsewhere for a market in which goods of equal quality can be procured at lower prices. Whether or not there is any objection, Sir Corbet said with emphasis: "We" [the gas undertakings] " must stand out for our right to buy in the cheapest market " that commends itself to our unfettered judgment—as you " will do." It seems that the British Gaslight Company have exercised their "unfettered judgment," with pecuniary advantage to themselves, and incidentally have also concluded that, under certain combinations, tendering can be reduced to something that does not fall a jot short of the ludicrous. Here are their gas-works at Hull with some of the largest pipe foundries of the country practically as their neighbours; and yet the lowest tender received for the delivery of pipes on their works reached them from a source which will involve the transport of the pipes by land and sea over 600 miles. The several higher British tenders, we believe, were all in amount much alike. There is something radically wrong in a trading system that permits the country to lose even a single pipe contract.

A Tale of Two Cities.

Six months ago before Mr. John Horsley Palmer retired through indisposition from the chair of the Imperial Continental Gas Association into the dimmer light environing an ordinary Director, he illustrated the marvellous vitality of the existing stations by pointing out how between them they had raised the volume of gas business in such a manner that they were not far short of recouping the business lost by the expiration of the Association's operations in the suburbs of Vienna. His successor in the chair (Sir Charles J. Jessel, Bart.), who last Tuesday had a warm welcome in that capacity, has told a still more interesting story of the power of recuperation possessed by the undertaking. Aix-la-Chapelle, as well as Vienna, has passed, through the efflux of concessionary rights, from the jurisdiction of the Association in the matter of gas manufacture and supply. During the past six months, the increase in the consumption of gas at the other stations of the Association amounted to 353 million cubic feet, or no less than 40 per cent. of the total output of both Aix and Vienna during the respective last six months of the operations of the Association in these cities. The reduction in the number of consumers by the loss of the two cities has also been recouped to the extent of 19,000 new ones, or 29 per cent. This figure tells a tale when contrasted with the 40 per cent. increase in consumption. It tells us that it is not the new customers who alone have caused an increase in the gas consumption, but that the extended use of gas for new purposes by existing consumers is largely responsible for the expansion of business. This is excellent, because additional consumption by existing consumers is really more profitable than new consumers are at the first, until in due course the

requirements of new ones develop, as develop they generally do, with the economies of, and conveniences produced by, the gas appliances of the time. The vitality of the Association is not confined to their old territories. New concessions (in obtaining which there has been great activity of late) enable the Association to push outwards their distribution systems. Old concessions are constantly being prolonged; and the purchase of the gas business at Anderlecht also supplies fresh ground on which to work. It was an instructive story in more ways than one that Sir Charles Jessel had to tell at the meeting of the proprietors; but this tale of the loss of two cities and of the big contributions the half year has made to the filling of the voids created in the business is the central feature of interest. It is not here a question of losing a single customer or a few customers, as in ordinary business. To lose whole cities at one time is something very much out of the ordinary; to recover the loss at the rate shown through the other stations is, to say the least, remarkable.

Heavier Traffic Charges.

THE anticipated announcement of an increase in the railway rates for the conveyance of merchandise of all classes has come; and with it there has been a fresh outburst of indignation from industrial areas generally. The question of the increase on coal and coke has been deferred for the present; but as most other goods are included in the term "merchandise," the transport of apparatus, appliances, and materials (other than coal and coke) required and for sale by gas undertakings will involve the already known additional rate. The increase (which is placed at 4 per cent., and is to take effect from July 1) is the result of the Railway Act passed earlier in the year, and the powers of which Act are the fulfilment of the Government's hasty and unqualified promise to the Railway Companies, as part of the condition on which the railway strike of 1911 was terminated, that they should be allowed to recoup themselves by enhanced rates on goods for the cost of improving the conditions of the employment of their labour and clerical staffs. The only thing the railway companies have to do under the Act, in order to obtain sanction to higher rates, is to satisfy the Railway and Canal Commissioners that there has been improvement. That is all. Though greater business and expansion of resources may have added materially to the companies' financial position, all this will, under the broad terms of the Act, be quite outside consideration; and only the one factor of improvement in the conditions of employment of labour and of the clerical staffs will have weight. This is a one-sided arrangement. But it is now the law. However, there is much to be said on both sides; and, whether or not it be true that the companies have already easily recouped themselves by extra demurrage, wharfage, and carting charges, and from other available sources of revenue, for the extra obligations entailed by recent legislation and the settlement of the strike, they have the legal right to raise the rates, and public opinion alone will not make them forfeit it. So far as it is possible to judge, the companies appear to be taking, in the circumstances, their full pound of flesh. It is not only a question of the extra cost on manufactured goods, but also on the raw materials required for the production of these goods; and we may be sure that the whole of the increase will fall upon the consumers. Costs of production on all sides have been rapidly increasing of late; and it has only been a fortunate boom that has made things come out so well as they have done. The public, however, has been the common hack, and has had the increased costs imposed on it. But the railway companies, working under statutory powers, are not in the same position as ordinary traders in being able to raise their charges as they please. They are now, however, in a new position so far as the cost of their labour and clerical staffs is concerned. If in the advantage that they take of the position, the companies are unduly grasping, they will only encourage a greater use of water carriage, and help to build up a still more beneficial position in this country for foreign goods.

The National Gas Exhibition Fund.

Good information comes to hand regarding the preparations for the National Gas Exhibition. There is a "steady stream" of contributions to the fund; and this steady stream must not cease until *all* gas undertakings have placed their names on the list. In one published reference to the matter, it is stated that "there is every promise of the subscription list eventually including every gas undertaking of any importance in the British Isles." That is excellent; but if subscribing to the fund is the determining point as to whether or not a gas undertaking is of importance, then every undertaking, irrespective of business magnitude, should come in. As a matter of fact, the administrators of every gas undertaking regard their concern as important; but in this particular matter, we shall be very much inclined to judge not the importance of the undertaking, but that of the administration by presence in, or absence from, the subscription list. It will be one test of progressiveness, and of willingness to participate in the new commercial life of the industry. It is pleasing to know that the evidence of widespread interest in the exhibition grows daily; and it goes without saying that this is very gratifying to those who have in hand the work of organization. May this gratification be but a foretaste of something greater in the autumn.

The Hot-Water Campaign.

In an article by "F.W.G." in the "Bulletin" of the British Commercial Gas Association, he states it as his deliberate opinion that the gas industry has not in all quarters yet awakened to the possibilities of the increased business in water-heating by gas that is waiting to be secured by the enterprising manager. We believe he is right. From inquiries that have been quietly made, it is found that in some districts the installation of the means of heating water by gas is being developed with a celerity that makes contrast with some other districts very striking. In some gas-supply areas the consumers, except through the advertisements of the Association in the daily and weekly Press, have not had their attention drawn to the convenience. This is to be regretted, for it does suggest that those responsible for local gas sales have not perceived fully that in water heating by gas there is a land of great promise. The business, as the article before us says [see p. 475], only needs cultivating on sound lines to bring a rich harvest to the industry. It is not a matter merely of the boiling-ring and the geyser. These are, comparatively speaking, toys. It is the domestic water-boiler to displace the coal-heated boiler that to-day should be the goal of ambition in this line. The smaller water-heating appliances are but stepping-stones to the larger use. This is a business that is an all-the-year-round one, and more important in the summer, from the gas sales point of view, than in the winter. But we opine that in the winter the gas-heated water-boiler will have the same history as the gas-cooker, only more of it within the field of service. Used in the summer, the convenience and rapidity of the gas-heated water-boiler will carry its use well into the winter, when prompt raising of the temperature of water is more essential, and hot water more constantly required. The Association are not only working to create a demand, but it will be seen, from the article of "F.W.G.," that they are prepared to go farther than this, and render other assistance. The water-heating business must not be taken up in any slovenly manner. Men who advise, plan, and fit up require to be properly trained in it; otherwise what should be a convenient, economical, and efficient system may, on one or all of these points, earn a bad name, for which there would be no justification under proper circumstances.

Creating Demand.

Demand for the boilers has to be created, interest has to be aroused, information has to be circulated; and how is this to be done?—by persistent advertising and articles in all sorts of places where the public eye will be arrested and the public mind be engaged and urged to inquire further into and to talk about the matter. The British Commercial Gas Association are just now making a speciality of this business. From reprint specimen sheets of last month's advertising work that have reached us from the Secretary (Mr. W. M. Mason), we see that the bulk of the advertisements in newspapers and periodicals have reference to the comfort, convenience, and promptness of the gas-heated water-boiler; a few allude to cooking. But it is the former business—the new business—that has to be attacked. The gas-cooker already occupies a large place in the world of daily affairs; and the gas-heated boiler, while it may not enter the cottage, should in time be established in the majority of the dwellings and business premises of ordinary gas consumers. The reprint of the

advertisements shows a widespread publicity; and this sort of thing means much more than creating immediate new business—it means also the increasing of the stability of the whole gas industry. The advertisements, which benefit the entire industry (but which unfortunately the whole industry does not assist in paying for), are an excellent testimony to the activity of the Association, and to the comprehensiveness of the appeals made, through its agency, to the public. Gas managers whose directors or committees are all the better for being kept in touch with the work of the Association should procure a copy of this advertisement reprint. Gas managers whose directors or committees have not yet resolved to become subscribers to the Association, should introduce one of these reprints to their notice. If they read the introduction on the front page, they will end up on the words: "Surely, no one will be content to reap without bearing a share in the cost of sowing!"

Gas-Works Profits and the Rates.

This is the period of the year at which news usually comes forward as to the financial results of the working of municipal gas undertakings during the twelve months to March. In many cases the full working statistics are published later—the first intimation made of the outcome of the year's operations being the amount of profit made, and the proportion that is to be allocated in relief of the rates. Briefly it may be said that the figures so far to hand are of a highly satisfactory nature, notwithstanding the fact that the past financial year had to suffer disadvantages from the effects of the national coal strike and from two Easters falling within the twelve months. Satisfaction has been expressed at Birkenhead with a welcome contribution from the Gas Committee of £13,000, though one member of the Council, at any rate, seemed to be of opinion that larger profits should be made by the undertaking—and handed over. It was, however, pointed out that the sum named was available in spite of the fact that the charges for gas were lowered by 10 per cent. twelve months ago. A slight reduction in the amount to be handed over by the gas undertaking in aid of the improvement rate is anticipated in Birmingham, where last year the sum given was more than £80,000. But in this connection it is pointed out that during the past twelve months the full effect of the reduced charges has been felt; the consumers having been benefited thereby to the extent of over £70,000, compared with the previous year. A sum of £5000 is to be devoted to the rates at Blackburn, out of a total profit of £10,000. The fiftieth annual report of the Engineer at Blackpool shows that in the past year there was a gratifying increase in the make of gas; and there is a good balance of profit, after meeting interest and sinking fund charges. The total amount to be appropriated from the trading undertakings at Bradford in relief of the rates is stated at close upon £40,000; and of this the gas department is down for £5000. It was stated that the gas-works had enjoyed another good year; but one member of the Council protested against the taking of such a sum as that named.

Some of the Figures.

The year has been a record one all round at Manchester—the nearest approach to the profit that was realized having been in 1903, when, however, the price of gas was 2s. 9d. per 1000 cubic feet, as compared with 2s. 3d. last year. The Committee have decided to allocate £50,000 to the relief of the rates; but next year the sum will be just over £52,000. There was an increase of 4½ per cent. in the gas consumption. An increase in the quantity of gas sold of over 11 per cent. is reported from Nelson, where reduced charges for power purposes have evidently had a stimulating effect upon the demand, though the figures are also influenced by the fact that for some time in the previous year the cotton-mills were closed. This large increase in consumption, and the installation of new carbonizing plant on the Glover-West vertical system, have made the past twelve months a period of unexampled activity for the gas department. For the second year in succession, a sum of £39,000 is to be allocated from the gas profits at Nottingham in aid of the rates, though the Gas Committee in the first instance proposed to devote only £34,000 to this purpose—an intention which, however, was changed at the behest of the Finance Committee. The past year has been a record one in the matter of profits; the quantity of gas sold showing a substantial increase over the preceding twelve months. Another place where all records have been broken in the matter of profits is Rochdale. Here the Gas Committee decided to grant £16,000 to the rates; a proposal to hand over a larger sum being defeated. Salford still retains a front position among the rate-aiding municipal gas authorities, with a contribution of about £44,000—and this in spite of reduced prices for gas. Such sums are, however, not to be anticipated by the ratepayers on future occasions. At Stalybridge, it has been resolved to carry a sum of £2000 from the gas-works revenue account to the credit of the rates, though it was pointed out that this would represent more than they had made in profit on the gas-works during the year. Larger profits are anticipated from the department; but it may be noted that some members of the Council are of opinion that, instead of handing money over in relief of the rates, the price of gas should be reduced. History, so far as the gas-works are concerned, has also been made at Workington, where all records have again been beaten. The make of gas went up by 4½ per cent.; and the profit is somewhat greater than for the preceding year, notwithstanding a reduction in the price of gas to ordinary consumers. The rates will benefit by a substantial sum; and further welcome concessions are announced in the matter of charges.

PERSONAL.

RESIGNATION OF MR. HUMPHRYS, OF ILKESTON.

As was to be expected, Mr. F. C. Humphrys, the former Gas Engineer and Manager of the Ilkeston Corporation, whose long service warranted the idea of more equitable consideration, has not been long content to remain under the recently effected arrangement whereby he was relegated to a secondary position. Government investigation into the circumstances attending the construction and subsequent disaster to the spirally-guided holder erected at the town works, made it tolerably clear that the Committee responsible for the change of plans, knowledge of which was carefully kept from the Local Government Board, were content for the time being to let the blame for what has since been condemned as a process of "hoodwinking" the authorities rest upon the shoulders of an official who had spent the greater part of his professional life in Ilkeston's service. It is true that there was an admission ultimately forthcoming that it was the members of the Committee themselves who were in reality responsible; but the confession was of a very belated character, after an unmerited brunt of criticism had been allowed to fall upon one who at the most could only be said to have carried out the instructions of those legally responsible for the administration of the town's affairs. Mr. Humphrys acquiesced for a while nominally in the altered arrangement under which, at a reduced salary, he was to fulfil the functions of Assistant-Manager. The plan, however, was not destined to be fruitful of satisfactory results, and, his successor having entered upon his duties, little surprise will be occasioned by the intimation, which was officially made last Friday, that Mr. Humphrys had now determined to sever his long official association with the town. It is at his own request that he is to be relieved of his position, and, conditionally upon this arrangement, he is to be paid the equivalent of three years' salary—a *solatium* which cannot be said to err on the score of extravagance, considering the length of his service, and the fact that the department of which he has had the charge has represented the only really profitable concern among the town's municipal ventures. Incidentally, considerable curiosity is being displayed locally as to the nature of the Local Government Board's reply, as to which no information has been yet publicly forthcoming, regarding the Council's application for a further loan for gas-works extension, the inquiry in respect of which elicited caustic official criticism of the Corporation's methods.

Particulars as to Mr. H. E. Bloor's appointment at York appear on p. 463 of this week's issue.

OBITUARY.

The death is announced as having taken place last Wednesday of Mr. Charles H. Nicholson, of the firm of Christopher James and Co., No. 155, Fenchurch Street. The deceased gentleman was a highly respected Past Master of the Evening Star Lodge, No. 1719—having been initiated into the Lodge in 1896, and, after having filled all the minor offices, elected W.M. for the year 1905. Mr. Nicholson was sixty-three years old.

A vote of condolence with the widow and family of the late Alderman David Milner has been passed by the members of the Bradford City Council. The deceased, who was the oldest member of the Council in point of service, took a keen interest in, and devoted a great amount of time to, the business of the Water Committee, of which he was Deputy-Chairman from 1903 to 1910, afterwards occupying the position of Chairman until his death.

The Junior Institution of Engineers are arranging for a visit on Saturday afternoon, the 24th inst., to the "King George Reservoir" at Chingford.

NOTES FROM WESTMINSTER.

"NOTES" that are worth special point from Westminster are scarce. This is a continuous feature of the present session. Now, our legislators have gone holiday-making until May 27; and after that we shall resume the general state of flatness in the Committee rooms.

Profit Appropriations for the Rates.

The Tottenham District Council have withdrawn their opposition to the Tottenham and Edmonton Gas Bill; so that there cannot be much, if anything, now standing in the way of the measure having a peaceful journey through parliamentary formalities. The Lymm District Council Bill has been before one section of the Local Legislation Committee, and has passed the scrutiny of that body. The clauses to empower the acquisition of the local water-works have gone through; and so have the schemes for the reconstruction of the gas-works and the extension of the gas-supply limits. There is one thing the Local Legislation Committee might as well make up their minds to do, and that is either to impose some limit on the sums that may be transferred to the rates from the profits of trading undertakings of local authorities or prohibit transfer altogether. It is senseless to let a system continue uncontrolled that has been so grossly abused. In the case of this Lymm Bill, the Local Government Board called attention to the fact that the Council were proposing to supply gas to an outside district, and suggested that, in view of this, there should be a limit imposed upon the profits that could be appropriated. The Committee, however, thought the case would be met by reducing the maximum price of gas from 6s. 8d. to 5s. What effect this is going to have in the direction indicated will puzzle the most perceptive of gas experts and financiers. Why not make a workmanlike job of the limitation of profits that may be appropriated by definitely specifying the amount? The Ebbw Vale Water Bill has passed a Committee of the House of Lords, with modifications, as set out in our "Parliamentary Intelligence."

ELECTRICITY SUPPLY MEMORANDA.

THE Point Fives Club has been much talked about during the past week. The members are trying, by activity, to make the niche tenanted by the club a bit larger. We are full of admiration for their progressiveness, and for the little in the way of encouragement that increases their ardour. Three new members have joined the club, having qualified for admission by adopting the Norwich system of a fixed percentage charge on the net rateable value of the premises supplied, and 0·5d. per unit for all energy metered. This enormous addition makes the total number of members thirteen; but, this being an unlucky number, Mr. S. T. Allen, who has passed from Carlisle to Wolverhampton, and so has left behind the qualification for his successor Mr. F. W. Purse to take up, has been elected an honorary member for twelve months. This will protect the thirteen members against any terrible happening, and will also give Mr. Allen time for redemption—otherwise, there will be nothing for it but, at the end of the period of grace, to kick him out as an unregenerate. The object of the fixed charge, *plus* the 0·5d. per unit, is to develop the electric cooking load; and, among the fourteen members, there are some who have very appropriate names. There is a Cooke, a Roles, a Ham(e), and a York one to boot. As the use of electricity, on any tariff, involves relatively large expenditure, Mr. Purse is appropriately a member of the club. The reinforcements have given the Point Fives unusual boldness. In the report issued of their last meeting, they unkindly refer to the "moribund state" of the Electricity Publicity Committee. That poor and much-abused organization (which has gone in for the sale of second-hand electric radiators), after struggling for some time and imperilling by its methods the souls of the responsible members, the while being expected to do great things without the necessary financial support, seems to be fast losing its remnant energy, as it certainly has lost nearly all the respect of outsiders as a live inventive publicity body in the electric supply industry. The Point Fives are proposing to fill the void that will be created if the Publicity Committee finally succumbs. The Point Fives have had a sketch produced for a poster and postcards, showing an electric-cooker that obviously had as its prototype a substantial gas-oven, with, in addition, a battery of switches, on the wall at the rear of the oven. The oven door is open, which is a sure sign that the oven is not supposed to be in use, as under no circumstances is it permissible to voluntarily allow heat to escape from an electric-oven—the heat units not being sufficiently plentiful for that at the price charged. On the top-plate cooking is going on; and the pictorially illustrated volume of "fumes" escaping from a small pan is enough to make a gas-cooker utensil very envious. It is clear from the illustration that the Point Fives are not enamoured of the less substantial "Tricity" form of cooker for kitchen use, about the defects of which Mr. Roles, the Electrical Engineer of Bradford, had something to say recently [*ante*, p. 158].

The Point Fives Active.

Standardization.

The Point Fives are growing ardent over the matter of standardization; and they are proposing to hold a special meeting next month to consider the matter in two respects. They are trying to move too quickly in this. The first suggestion is for the structural standardization, as far as practicable, of electric-cookers. This is a matter that has been mentioned before; and, though it is not our business, the view was then expressed by us, speaking from experience, that time is too young in the history of development, and that the exercise of individual ingenuity and investigation has not yet had sufficient play, to talk of stereotyping anything in connection with the electric-cooker. At this stage of things too, the manufacturers like to maintain some difference from other makers' goods—and rightly so—in order to possess special features about which they can talk for the purpose of inducing custom. If they were to adopt types with features common to all, it would then only leave them price competition with which to work-up business. The second standardization matter the Point Fives intend to discuss is that of "the rateable value," *plus* ½d. per unit tariff for domestic purposes. The ½d. is already standardized among the Point Fives; but how they hope to upset all the principles of rating by standardizing "the rateable value," we do not see. We suspect that what they are really intending to discuss is not the standardization of rateable value, but the standardization of the percentage on the net rateable value of premises which constitutes the basis for the fixed charge. The percentages adopted in the framing of this particular form of tariff are somewhat dissimilar; but in the main they are between 10 and 15 per cent. Net rateable value, however, varies considerably in different districts; so that it is difficult to see how the percentage could be made uniform, and do justice as between district and district, and between consumer and consumer. Uniformity, too, disregards the factor of necessity. The conditions of an electric supply undertaking in one area may require a larger percentage on the net rateable value than those in another area; and the charge for gas in one area may compel for competitive purposes a lower percentage than in another area. The standardizing of the fixed charge on the net rateable value as well as the charge per unit does not supply any elasticity to meet local circumstances. This is no concern of ours, however; but we like to occasionally show a little neighbourly interest in the political affairs of the younger industry, apart from contentious subjects. Some people who can afford to pay lump sums down, with a small charge per unit afterwards, seem to like the system. Out of 918 consumers in private houses that Mr. Roles has at Bradford, 471 are on the special domestic rate, paying a fixed charge of 15 per cent. on the net rateable value, and ½d. per unit beyond. The remainder are on the flat-rate.

The New Order.

Upon many matters that are of the daily commonplaces, there is often very divergent thought; and the divergency is sometimes found to be due to the thought (however superficial and foolish it may be) suitably fitting one's own interests. But in hoping that thoughts of this character are going to be always accepted by other people is to value very lightly the commonsense of the latter. If we read correctly, a summary that is before us of what is described by an electrical contemporary as a thoughtful article from the pen of a writer in "Installation News," it would seem that, prior to the advent of electric cooking (close to which advent it has remained), no one knew how to cook, nor was cooking done under cleanly and hygienic conditions. Such absurdity, if not imagined for the sake of saying something, surely can only have come from the narrow and unfortunate experience of the writer in his own home life. The person presenting the abstract of the "thoughtful" article says that it also points out "the beneficial effects upon the health of the race, which must result when everyday meals are prepared on perfect principles of cleanliness amidst ideal hygienic surroundings." Then the writer asks "whether many of the visitors to hotels and restaurants, or owners of large houses, are aware of the conditions generally and almost universally prevailing in the kitchens? Their equipment prevents the possibility of maintaining the remotest appearance of cleanliness and order, while the inclinations of the cook are not always on the side of cleanliness." We need only repeat that the narrowness of the experience and knowledge of the writer is given an exceptionally fine testimonial by his own hand. Of course, "with the advent of electrical cooking methods, a new order of things is created." All the wonderful chefs and cooks who have earned glory by their achievements for the table will learn with dismay that the praise of their doings has been all a mistake, and that they are now to be exposed as charlatans of the worst type. And how? With the coming of electric cooking, "intelligent operators will be forthcoming to supervise the preparation and the cooking of sound [unsound foods should not be cooked] foods on correct lines, and nothing but good can arise from such a state of things." Are the intelligent men of the electrical industry proud of this sort of persiflage? If they are, we are frankly sorry for the measure of their intelligence. There is one thing the writer urges that is not so hollow as all that has gone before, and that is that a simple and readily understood system of tariffs is desirable to help along electrical cooking. There are many other things that are required; but, concerning this particular one he considers the policy of a uniform gas tariff, and a single meter, has proved eminently successful in the case

of gas supply. He also asks for a fool-proof apparatus, with an assured long life; and he warns against cutting prices until these *desiderata* have been obtained. As electric cooker manufacturers cannot live by production without profit, they may he trusted not to make fools of themselves by unduly cutting prices.

Mr. (not Mrs.) Beeton.

While speaking of some of the humbug that is so prolific in the electric supply industry, we may as well put one or two questions to Mr. H. R. Beeton, the Chairman of the Brompton and Kensington Electricity Supply Company, and of a subsidiary enterprise known as the Brompton and Kensington Accessories Company. The Company have established in Earl's Court Road an electric restaurant, and about forty persons were invited to dinner there a few days ago to celebrate the completion of the restaurant advertising project. Mr. Beeton was at the time possessed by a most unchristianlike spirit. He stated that it was a "consolation" to him that gas had been practically routed from the field of lighting. The first question is, Is Mr. Beeton aware that daily between 6 p.m. and 6 a.m. the consumption of gas in the United Kingdom is, despite the use of the higher efficiency incandescent gas-burners, practically the same as it was per twenty-four hours twenty years ago; and, if so, will he say what that gas between 6 p.m. and 6 a.m. is now used for? If he is not acquainted with the fact, it may interest him to know that during the twenty years the consumption of gas has about doubled, and about 50 per cent. of the total gas consumption is now used during the daylight hours. Mr. Beeton further remarked that "in competing with gas he felt that they were offering a superior article." The second question is a double-barrelled one, and is what makes him have such a funny feeling, and in what way does he think the article is superior? Is it in its greater heating value, or its greater reliability, or its greater expedition in performing work. If not, what is it?

Shop Lighting Crimes.

Mr. H. E. Goody has been writing a slashing article on the present vulgar and wasteful methods of shop lighting; and it has been published in "Electrical Industries." The Editor of the paper says, in a prefatory note: "It will be recognized that there is a measure of sanity in his [Mr. Goody's] denunciation of high candle power outside shop-lighting units being in the direct line of the vision of pedestrians in the street." We do not suppose the lamps would be in the direct line of vision of pedestrians if the latter were anywhere else but "in the street." The readers of the paper will acknowledge the compliment paid to their intelligence by the remark that "it will be recognized," &c.; but whether Mr. Goody will take it as a compliment that there is only "a measure of sanity in his denunciation" is not known, seeing that "a measure" appears to imply that there is somewhere a balance of something of an antithetical order. However, Mr. Goody protests strongly against the lighting "barbarities" perpetrated nowadays by the suspension along shop fronts of flame arcs projecting a "yellow glare" and a "bilious yellow" over the roadway. He thinks the only method of properly lighting shop windows is by lamps hung inside and not outside, which inside lighting has been found rather dangerous. If arc lights are hung outside, it is in his opinion impossible to get the clear definition obtainable by interior lighting. That may be. But with high-pressure gas-lamps suspended outside a shop so that the light does not fall into the eyes of the person examining the goods in the window, a very clear definition is obtained, and coloured goods are presented as nearly in their natural tones as it is possible to get them by artificial light; and that is something which cannot be obtained with yellow flame arcs. The so-called white arc, he also says, will not harmonize with metallic filament lamps. Therefore we come to this, that in Mr. Goody's opinion there is not a modern electric arc lamp that is suitable for shop-window lighting. Mr. Goody cannot understand why the shopkeeper has "allowed himself to be cajoled into spending huge sums of money in lighting up the pavement." He does not think it is a sufficient answer to say it is done for the sake of advertisement. The advertisement aspect of the question depends largely on the character of the shopping area. For the sake of attraction, we cannot conceive that high-power outside shop lamps are needed in Regent Street, Oxford Street, and such-like world-famed thoroughfares. But getting farther away from any such thoroughfares, with their high-power street-lamps maintained from the public purse, to shopping areas to which it is desired to attract people, or to prevent people going to the more opulent shopping centres, there light does attract. Light induces people to go out; and people will go where there is light. This has been found true in many areas where the tide of local trade had more than begun to ebb. The trouble in the past has been that the novelty of the bilious yellow and glaring flame arc lamps caused them to be selected by tradesmen. But the latter are showing greater and wiser discrimination now, and are largely adopting the less glaring, less flickering, more reliable, and altogether more suitable high-pressure gas-lamps.

The Making of Harwich.

We do not know Dr. C. H. Leibbrand, and perhaps it is as well we do not say what we think of a scheme propounded by him, with Mr. Napier Prentice, the Electrical Engineer, and inventor of the "Lightning" electric cooker, and the other gentlemen supporting him, or at all events sitting on the same platform with him. However, it may happen that some of us may live to see statues of the worthy doctor and of the worthy Napier Prentice erected by the grateful burgesses of Harwich in some prominent position in the town. The doctor wants to make Harwich a free port; and by a scheme of many parts, he desires to raise it to a position in the world of commerce that it should occupy. An electricity supply is part of the project; and the doctor proposes to adopt in this connection "what is called a centrifugal machine, and all they would want for the purpose would be half a million pounds." This is charmingly inexplicit, and delightfully intangible. However, by means of the centrifugal machine, the doctor told his entranced hearers that he would be able to supply current for lighting purposes at 3½d. per unit and for power at 1d. Then came Mr. Napier Prentice. He felt himself utterly incompetent to go into the mighty and powerful regeneration schemes of the doctor for the raising of Harwich into one of the foremost cities of the world—its rightful position; but he could talk about electricity. Mr. Prentice cuts his ambition off at the point where he would like to make Suffolk a second Lancashire by the aid of the factory magnetic force of electricity. Of course, if things go on at this rate, there will not be enough factories to go round. The factories that Mr. Prentice draws into Suffolk will be lost elsewhere. Then Dr. Liebbrand waxed warmer still over the mammoth productions of his mighty brain. The financing of the scheme for raising Harwich to its proper place in the world seems to be a comparatively simple matter. He intends to raise the money by extracting one million pounds from France, one million from Holland, one-and-a-half millions from the North of England, and two millions from the "Yankees." That is quite a simple matter. Will not other towns be envious! How they will all wish for a Dr. Leibbrand in their midst! And yet a correspondent in sending a newspaper report of the ratepayers' meeting at which these glad tidings were announced, writes "Piffle" where we cannot fail to see it. Some people are hard to please.

In the Summer Time.

The marvels of electricity as popularly described are overflowing the banks of any former conception. The "Standard," in its "Electricity in the Home" article, tells how summer time is coming, and there is nothing like electricity then. For lighting nothing can be cooler; notwithstanding the fact that electric lamp heaters are advocated for winter use. But there is something still more wonderful. There is nothing like the electric-oven for summer use. Why? Listen to this: "The heat generated in the electric-cooker is confined almost entirely to the cooker, and the object to be cooked; it can be generated at a moment's notice." Where does the heat go to? And why the necessity for continuing to generate heat during the time the oven is in use? Really the public must laugh when they read of these attempts to trespass upon their intelligence.

A Pipe Contract Goes to the Continent.

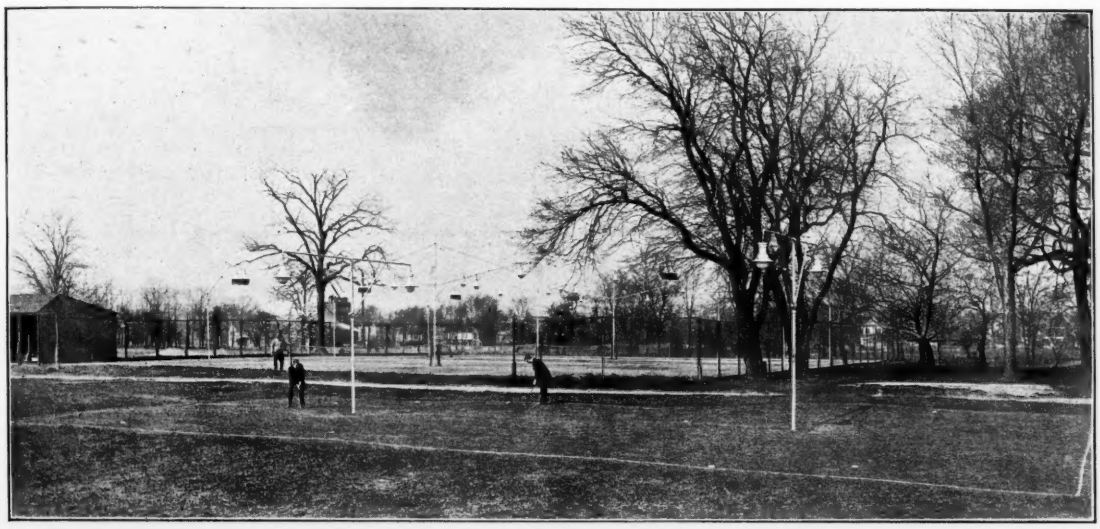
The British Gaslight Company, Limited, have accepted the tender of the Société Anonyme des Hauts-Fourneaux et Fonderies at Pont-à-Mousson for the supply of some cast-iron pipes required at their Hull works—the quotation of the French Company having been the lowest received.

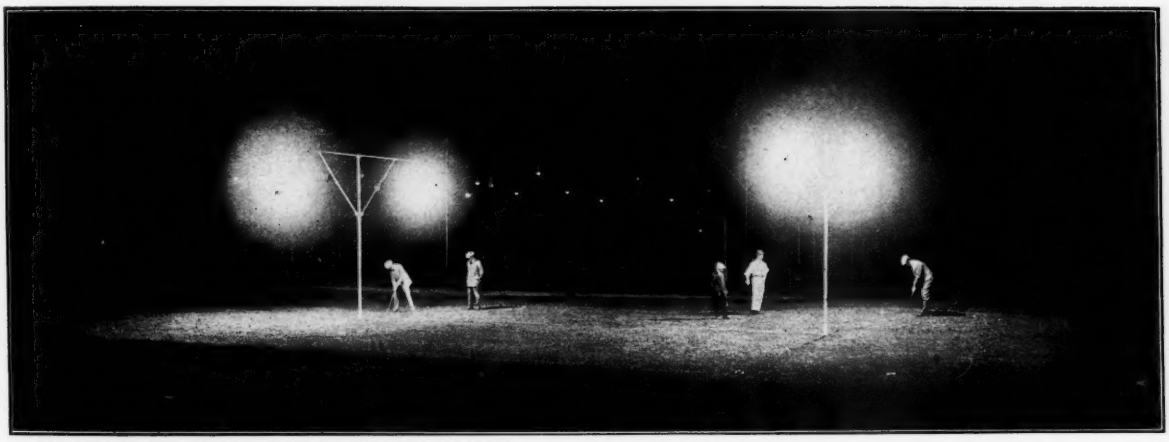
Gas Lighting of Factories and Mills.—The Publicity Committee of the American Commercial Gas Association have issued one of the neatest booklets on this subject which have come under our notice. It contains 40 small oblong pages, 33 of which furnish particulars, with excellent illustrations, of the methods of illuminating the different departments of factories and mills. As the pictures and the details are side by side, information is conveyed practically at a glance. A "Foreword" contains a useful table, showing the cost of incandescent gas-lamps, burning 1000 hours, as compared with electric lamps of similar candle power.

Distinctive Colours for Pipes.—About two years ago, German engineers and metallurgists came to a preliminary understanding that it was desirable to mark pipes carrying certain fluids by particular colours, so as to avoid confusion. The question has since been eagerly discussed by the technical institutions and chemical manufacturers; and the majority of authorities have agreed that the following colours should be used for the purposes named: Water, green; gas, yellow; air, blue; steam, white; acid, pink; lyes, violet; oil, brown; tar, black; vacuum, grey. Other marks can be added. It is proposed, for instance, that an ordinary steam-pipe should be white. A red ring would indicate a pressure of more than two atmospheres; two red rings high-pressure superheated steam; a green ring would distinguish the exhaust-pipe. Pipes for ordinary gas, or for purified blast-furnace gas, would be painted yellow. The red ring might indicate coke-oven gas, the black ring blast-furnace gas not purified, the green ring water gas, the blue ring producer gas, &c. The writer of a note on the subject in "Engineering," from which these particulars have been taken, remarks that the adoption of these rings or other distinctive marks would cause a slight expense; but it would also prevent confusion and waste of time often caused at present in identifying pipe systems.

NIGHT GOLF PUTTING COURSE.

By T. J. Little, jun., of the Welsbach Company, of Gloucester City, U.S.A.





Last year an article was published describing the lay-out of the lighting of the tennis courts at the Woodbury County Club, Woodbury, New Jersey. This was probably the first extensive installation of its kind in the world. The installation proved so popular that it occurred to the writer that it would be a good scheme to extend this field of artificial illumination to include the lighting of a golf putting course. Such courses have been in vogue for some time—their usefulness, of course, being limited only to the daylight hours.

The course is laid out on a plot of ground 40 feet by 80 feet (as per diagram next page) and contains nine holes. The grass is trimmed closely as on a putting green; and while such courses were originally intended for the practising of putting, they are now being used extensively for putting matches.

It must be evident that night playing on such a course would be highly desirable. In the first place, only a limited area has to be lighted; in the second place, it makes it possible for business men and others who have not sufficient time at their disposal during the day to practise putting or to play a putting match at night.

A night tournament has already been played. It is perfectly possible for twelve persons to occupy the course at the same time; and it has proved an extremely novel and popular recreation.

In the game of golf, much depends upon the ability of the player to putt properly. He may get a wonderfully long drive; but when he has finally landed his ball on the putting green, he may lose what advantage he may have gained by his phenomenal drives by not being a proficient putter. It was to develop this particular part of the game that the courses referred to were originally designed.

The installation of the lamps is comparatively simple. Two wrought-iron posts made of 2½-inch iron pipe (as shown by the diagram) are used; and two lamps are suspended from the ends of a long cross arm on the top of the posts. Four five-mantle Welsbach "Multi-Flex" inverted gas arcs are employed to light the course. To reduce glare to a minimum, opaline globes were used on the lamps.

A fairly uniform distribution of light over the course is desirable; the principal requisite, of course, being to have the nine holes uniformly lighted. This was accomplished by spacing the holes so that they were not more than 10 feet horizontally distant from the lamps.

The lamps are equipped with standard distributing reflectors; for it was found that the players not only desired to play on the course itself but to approach the course with a mashie. It is possible to do this at a distance of at least 100 feet.

The intensity at various holes is approximately 2⅛ foot-candles. The holes are painted white inside, to make them easily visible from any part of the course. To get a good idea of the ample illumination provided, it might be stated that it is considerably higher than that on the floor of an ordinary house at night, as it is usually lighted.

The illumination as before explained, is remarkably uniform, as will be seen by the photograph, which was taken by the light of the lamps alone on a dark night at 1½ minutes' exposure.

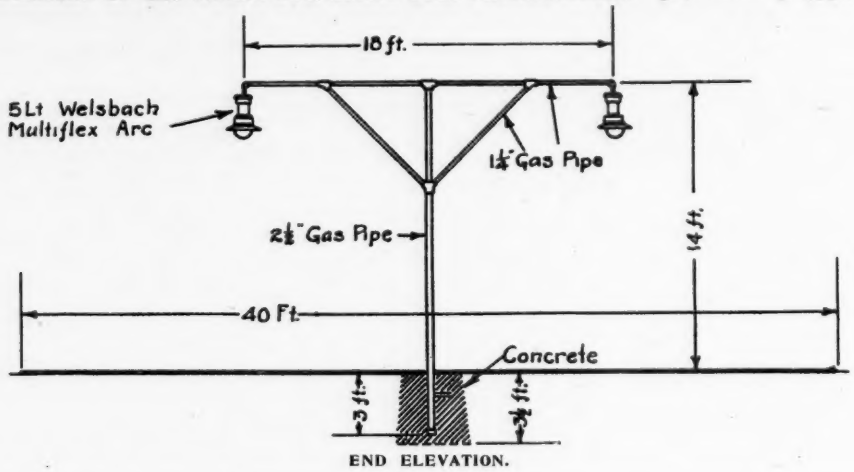
It will be noted that the ball is clearly distinguishable in the picture. Fortunately, from the illumination standpoint, there is a good contrast between the white ball and the grass. The writer has been able to easily distinguish the ball on this green at a distance of 200 feet from the course.

The day photograph shows the scheme of installation. The posts are painted white, to match the gas arcs, which are finished in white enamel steel, and ornamented with gold bands. In this photograph it will be noticed that the gas-lighted tennis courts are shown in the background. Night tennis proved quite an attraction last year at the Club. The courts were crowded every clear evening; and there were always a number of players on the "waiting list." Business men who had not played tennis for several years, because of insufficient time, played there last year at night. It is interesting to note that during the past winter there was a very severe wind storm in this locality, which uprooted a number of trees but did not bend any of the poles.

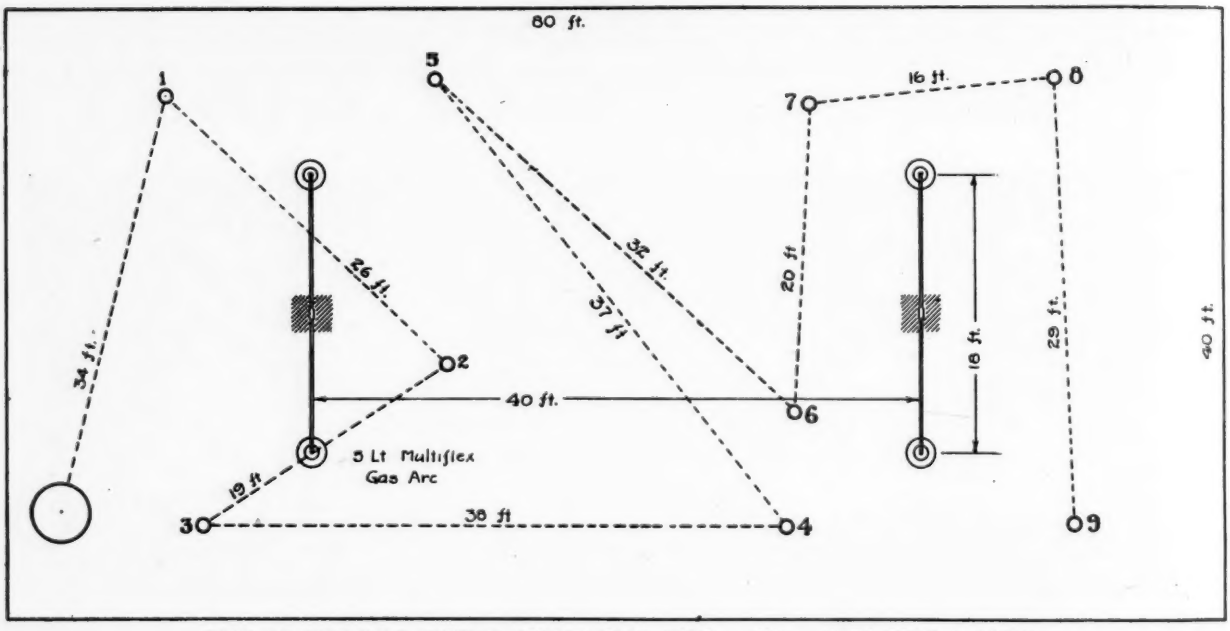
The cost of lighting the golf putting course is 7¼d. per hour for the gas consumed for the whole four lamps—each lamp consuming from 18 to 20 cubic feet of gas per hour. The cost of gas in Woodbury is 7s. 6d. per 1000 cubic feet.

The installation certainly represents a new achievement in gas illumination by the Welsbach system.

DIAGRAM OF GAS-PIPING FOR NIGHT GOLF ILLUMINATION. [See article p. 453.]



END ELEVATION.



PLAN OF NINE-HOLE PUTTING COURSE—EACH HOLE 10 TO 11 FEET FROM A LAMP.

THE NEW GAS-WORKS FOR MANILLA.

It was announced in the "Journal" rather more than twelve months ago that a concession had been granted to a Swiss-German group to erect works, lay mains, and carry on the usual business of a gas undertaking in Manilla, the capital of the Philippine Islands. The services of Mr. H. King Hiller, formerly Engineer of the Shanghai Gas Company, were secured as Consulting Engineer; and Mr. A. O. Jones, who was Assistant Gas Engineer to the West Bromwich Corporation, was engaged to organize the propaganda work in advance of the gas supply, and subsequently manage the undertaking. He left England last summer; and we have recently received from him a copy of a local paper containing an account with illustrations of the progress of the works, the construction of which has been pushed on so rapidly that they are expected to be ready in October next.

The tenders for the excavation work in connection with the laying of the mains were invited in August last; and the contract was awarded by Mr. Paul Grossmann, the representative of the Contractors (a Bremen firm), on the 24th of September to the Atlantic Gulf and Pacific Company. The work has been carried out under the supervision of Mr. Grossmann and one of his Assistants (Mr. W. Paternoster). The entire length of mains will be 45 miles; and at the date of the paper just received (March 31) about 27 miles had been laid. Mr. Jones has been so active in his department that orders for gas installations are, it is stated, "pouring in."

The construction of the works is under the direct control of Mr. E. A. von Wittgenstein, the other Assistant of Mr. Grossmann. The retort-house is a steel structure 86 ft. by 38 ft., and 49 ft. high. It will contain five beds of nine retorts. There are to be three purifiers, 15 ft. by 13 ft., and 5 ft. deep, charged with oxide of iron. A two-storey building 78 feet long and 72 feet wide, and having a tower 50 feet high, will contain the water, tar, and liquor tanks. The station-meter house is a two-floor structure, and stands upon an area of 120 square yards. The meter will have a capacity of about 17,600 cubic feet per hour. The workshop and store occupy an area of 240 square yards.

The foundation for the gasholder tank rests on 871 piles, over which is a layer of concrete 10 feet thick. The holder (a two-lift) will be 82 feet diameter, with a capacity of 250,000 cubic feet.

The office building is a single-storey one; but the manager's residence has two storeys. On the lower floor is a large reception hall, drawing-room, kitchen, pantry, and servants' quarters. Above are two bed-rooms, a sitting-room, and modern baths with hot and cold water. The superintendent's residence is a concrete bungalow, with three rooms, kitchen, pantry, servants' quarters, and bath. It has a spacious verandah.

The coal will be discharged at a wharf from lighters receiving their cargo from steamers in the bay. It is in contemplation, however, to make arrangements with the Manilla Railroad Company for laying tracks through the works, so that the coal can be taken up to the plant by train. Every building that has been put up or is in course of construction is so arranged that extensions can be made at any time; and, if necessary, the capacity of the plant, which is at present abont 141½ million cubic feet per annum, can be doubled.

The Manilla Gas Corporation was registered on Oct. 16, 1912, with a capital of 1,500,000 pesetas, in 1500 shares. Of the entire capital, 25 per cent. was offered for sale locally—300,000 pesetas subscribed, and 75,000 pesetas paid up.

The Scottish Junior Gas Association (Western District) have arranged a rail and steamboat excursion for Saturday afternoon, the 24th inst. The Hon. Secretary (Mr. David Fulton) also forwards copies of circulars showing that a joint visit of all the Junior Associations to the National Gas Exhibition has been fixed to take place on Saturday, Oct. 18. The Council of the Association, believing that many of the members will desire to visit the exhibition, have agreed to join in the visit; and definite particulars regarding fares, &c., will be sent out when ready.

RECENT IMPROVEMENTS IN METHODS OF GAS ANALYSIS.

By Dr. LEONARD A. LEVY, M.A. (Cantab.), F.I.C., F.C.S.

IN a letter published in the issue of the "JOURNAL" for Oct. 29 last, the author promised to give (when his experiments, then in progress, were finished) an account of a new method—so far as anything in gas analysis can be termed "new"—which he had devised. The experiments have now been completed; and a description of the new and simplified methods is given in this contribution.

In order to indicate the directions in which he considers some improvement has been made, and to render this account more complete, the author has thought it desirable, even at the risk of recapitulating information which is fairly generally known, to dilate somewhat upon those aspects of gas analytical methods which appear to him to be unsatisfactory. The first part of this article is therefore devoted to a consideration of some new and old processes employed in gas analysis. The author has assumed that anyone reading Part I. is familiar with the details of the preparation and use of absorption reagents, or else has access to the many published works which give these details. The second portion is devoted to a description of some new types of apparatus wherein it has been sought to delete as many as possible of the defects inherent in the analytical processes as ordinarily applied.

PART I.

The various components of a complex gaseous mixture can be divided into two classes—absorbable and non-absorbable.

(*a*) ABSORBABLE CONSTITUENTS.

The absorbable gases in a mixture are estimated volumetrically by absorption by a selective reagent which completely removes the constituent, without in any way affecting the other gases present. In analyses of coal gas or water gas, the components usually estimated by absorption are carbon dioxide, unsaturated hydrocarbons, oxygen, and carbon monoxide. An ideal absorptiometric method is one in which the particular component is completely and instantaneously removed without any other portion of the gaseous mixture being affected either by solution or addition. Some of the processes commonly practised conform very closely to these ideal requirements, whereas others are so faulty that, without special precautions, the results yielded are absolutely unreliable.

1.—CARBON DIOXIDE.

The estimation of carbon dioxide by absorption calls for no comment. The process is rapid and complete. An aqueous solutiod of caustic potash is always employed.

2.—UNSATURATED HYDROCARBONS.

Two reagents are recommended for absorption of the olefines—bromine and fuming sulphuric acid. The reagent most commonly employed is an aqueous solution of bromine. This may with advantage be dissolved in a fairly strong solution of potassium bromide. It is considerably more soluble in this than in pure water, or, to put it in another way, the vapour tension of the bromine over the potassium bromide solution is far less for equal concentrations and temperatures. The bromine is held in very loose combination with potassium bromide, as substances corresponding to KBr_3 and KBr_5 have been shown to exist in the solution. Bromine is a very efficient absorbent, and is practically instantaneous in its action. It has, however, a serious drawback inasmuch as it cannot be employed in the ordinary way with mercury as a confining liquid. Even a very dilute solution of bromine in potassium bromide gives off sufficient bromine vapour to soil the mercury in a very short time. This defect has been completely overcome by the use of a special duplex pipette which is described in Part II. of this article. By means of this pipette, the bromine fumes are never allowed to come into contact with the mercury, and thus the surface of the latter always remains clean and does not become fouled.

Fuming sulphuric acid is not used to so large an extent. It is a very unpleasant substance to manipulate and, when employed in a pipette, there is considerable tendency to choking up the finer tubes, owing to the formation of tarry matter. In the case of an apparatus, such as one of the instruments described further on, in which the gas to be analyzed is measured at constant volume, it is desirable to introduce the absorbing reagent on the surface of the mercury in the absorbing vessel. For this purpose, bromine is most unsatisfactory. Solutions of bromine, no matter how dilute they be, always react with the mercury and foul the surface very badly. For this purpose, therefore, fuming sulphuric acid, if employed properly, is preferable to a bromine solution. Fuming sulphuric acid itself attacks mercury quite energetically, and forms solid masses which choke up the tubes. If, however, the acid be mixed with concentrated sulphuric acid so that its specific gravity is 1·84 (the mixture containing about 10 per cent. of SO_3), it will not attack the mercury to any serious extent, and is quite suitable for the absorption of the unsaturated hydrocarbons. No trouble due to charring can arise, as the reagent is only used once and then discarded.

A third alternative worthy of consideration is as follows: Ordinary concentrated sulphuric acid absorbs the olefines at ordinary temperatures very slowly. As this reaction is one which actually occurs, it is theoretically possible to accelerate its rate by the use of a suitable catalyst—*i.e.*, a third substance which is present in small quantity and is itself unchanged. This idea has been worked out by Lebeau and Damiens, whose results are given in a communication which appeared in the "Comptes Rendus" for Feb. 17, 1913. These investigators state that solutions of vanadium pentoxide, and of certain other oxides, in sulphuric acid absorb the olefines rapidly and completely. A solution of vanadium pentoxide in ordinary concentrated sulphuric acid is said to absorb 150 times its volume of ethylene in a few minutes. A solution of uranyl sulphate in sulphuric acid behaves similarly; while in the case of sulphotungstic and sulphomolybdic acids the absorption is slower. The reagents are prepared by dissolving, by the aid of heat, either 1 gram of vanadium pentoxide or 6 grams of uranyl sulphate in 100 grams of concentrated sulphuric acid.

The author has made some trials with absorbents prepared according to the instructions given; but the results obtained up to the present are disappointing, and do not appear to justify the statements made in the original paper. The uranyl sulphate reagent behaves most satisfactorily, and completely absorbs the olefines from coal gas after shaking for about a quarter of an hour. The vanadium pentoxide reagent was not so good, and the author has been unable to effect a complete absorption in a reasonable length of time. If these reagents can be made to work rather more rapidly, they undoubtedly constitute a great improvement upon any at present in use. As there are no acid fumes, the necessity for the use of potash for their removal is obviated, and thus a saving of time is effected. The reagents do not react with mercury to any considerable extent, and would therefore be suitable for use in any constant volume apparatus. These absorbents have no action upon carbon monoxide.

In the same paper, a formula is given for the preparation of a new reagent for the estimation of acetylene apart from the olefines. The usual reagent for acetylene is ammoniacal cuprous chloride, which, of course, also absorbs carbon monoxide. The following formula is given:—

Mercurous iodide,	25 grams.
Potassium iodide,	30 grams.
Water,	100 grams.

The reagent, when required for use, is made alkaline in the pipette by adding a small piece of solid potash. One cubic centimetre of this solution is stated to absorb 20 c.c. of acetylene. It is without action upon the olefines.

3.—OXYGEN.

The absorption of oxygen is usually effected by an alkaline solution of pyrogallic acid. Unless prepared in the proper manner, this reagent is rather slow, and a somewhat prolonged contact of the gas and the absorbent is necessary. The reagent is best prepared as follows: 10 grammes of pyrogallic acid are dissolved in 100 c.c. of a saturated solution of caustic potash, specific gravity 1·55. This solution absorbs oxygen with great rapidity. It has a very low co-efficient of absorption for other gases, and produces no trace of carbon monoxide. If this reagent is at all diluted with water, its activity is greatly impaired. This fact is not so widely known as it should be, and the slow oxygen absorption as usually made is due to the incorrect dilution of the liquid. A disadvantage of the absorbent is that it becomes slow in its action if rather cold.

A new reagent which has been proposed for the estimation of oxygen is composed of an alkaline solution of sodium hydrosulphite. It absorbs oxygen with equal readiness at high or low temperatures, and is cheaper than pyrogallic acid. It is prepared by dissolving 50 grammes of the salt in 250 c.c. of water and adding to the solution 40 c.c. of caustic soda solution containing 500 to 700 grammes of water.

Phosphorus is not very convenient for the estimation of oxygen, owing to the inhibitory action exerted by the presence of traces of many substances which entirely prevent the absorption.

4.—CARBON MONOXIDE.

The only substance employed for the absorption of carbon monoxide is cuprous chloride, either in acid or ammoniacal solution. Unless special precautions are taken, the estimation of carbon monoxide by absorption is a very faulty operation, and falls very far short of the ideal. The absorption process is quite slow; and it is never possible to remove all the carbon monoxide by one application. Authorities differ as to the precise number of applications necessary for the complete removal of all traces. At all events, two applications are certainly required in order to obtain a result of any value. It is never possible to remove all the carbon monoxide by one treatment only. If used in a pipette the cuprous chloride solution, after it has absorbed a certain amount of carbon monoxide, only holds this gas in very loose combination, and will actually evolve some if shaken with a gaseous mixture of which the partial pressure of the carbon monoxide is less than that of the used reagent. It was for these reasons that the author devised the special apparatus for the estimation

of carbon monoxide described in the "Journal of the Society of Chemical Industry" for December, 1911 [See also "JOURNAL," Vol. CXVII., p. 87]. The carbon monoxide is selectively and completely oxidized in this apparatus to carbon dioxide, which is allowed to neutralize a measured portion of standard baryta solution. An observation of the volume of gas required for this operation gives the percentage of carbon monoxide. It is, therefore, evident that the methods of estimation of carbon monoxide, in instruments for the analysis of gases, are capable of very considerable improvement.

Apropos of the question of the estimation of carbon monoxide, it may be of interest to mention a method devised by the author for the estimation of this gas, which presents some points of novelty. The method has not been fully worked out, but the preliminary experiments are promising.

Donau [Akad. Wiss. Wien. Sitz. Ber. 114, p. 79] found that a dilute solution of gold chloride is reduced by carbon monoxide giving a solution of "colloidal gold"—*i.e.*, gold particles of ultra-microscopic size, which do not settle and apparently form a homogeneous mixture with the liquid. It occurred to the author that this reaction might be arranged for the analysis of carbon monoxide. The colour of the chloride gold solution is a very pale yellow; but after reduction, it is ruby red. Two arrangements of this reaction suggest themselves:

(*a*) The gas is aspirated through a fixed volume of gold chloride solution at a standard rate, and the process continued until the tint of the reduced solution exactly matches a standard comparison colour. The volume of the gas passing through the liquid is a measure of the percentage of carbon monoxide.

(*b*) A known volume of gas is drawn through a fixed volume of gold chloride solution which is contained in a glass-bottomed tube fitted with a micrometric eyepiece; the latter being screwed-up until the colour displayed by the solution exactly matches a standard. The micrometer head is graduated empirically against gases of known content of carbon monoxide.

These methods of analysis would be valueless if other gases capable of reducing the gold chloride solution with the production of colloidal gold were present, and are more particularly applicable to a special estimation of carbon monoxide only, rather than to a successive determination of various constituents.

The following is a summary of the results obtained on passing various gases through a very dilute solution of gold chloride:

(*a*) Oxygen, nitrogen, hydrogen, carbon dioxide, marsh gas, no action.
(*b*) Ethylene, sulphur dioxide, reduce without the formation of colloidal gold.
(*c*) Hydrogen sulphide gives brown colour and ammonia a yellow precipitate.
(*d*) Acetylene gives a red solution of colloidal gold.

It therefore appears that acetylene and hydrogen sulphide are the only gases likely to interfere with the test.

The following observations are an indication of the possibilities of this method. The gas used was the mixed coal and water gas from the laboratory supply.

Carbon Monoxide. Per Cent.		Gas Aspirated. c.c.		Time. Minutes.
12·2	..	129	..	14
12·2	..	130	..	13
12·2	..	125	..	11
11·8	..	134	..	14
11·8	..	137	..	14
11·8	..	136	..	13
11·4	..	140	..	14
11·4	..	138	..	14
11·4	..	141	..	14

The above results indicate that a difference of 0·5 per cent. should be readily detected by this method. Regarded purely as an analytical method, the reaction exhibits several intrinsic defects. The principal difficulties are:

(1) The vessel containing the gold chloride solution must be thoroughly rinsed out with distilled water, as traces of electrolytes coagulate colloidal gold causing the colour exhibited by the solution to become violet.
(2) The matching liquid will vary in colour according to the light in which it is viewed, and different solutions would be required for use by daylight and by artificial light. Furthermore, there is always a degree of uncertainty in the matching of two colours by different observers.
(3) The test is purely empirical.

(5)—Hydrogen.

Hydrogen may also be classed with the absorbable gases, although it is preferable to estimate it by methods of combustion. Hydrogen can be directly absorbed by palladium sponge. The method was worked out by Hempel. It is necessary to have a thin film of oxide on the surface, as otherwise the absorption does not take place. The method is of no great value, as the reaction is very easily inhibited by the presence of other substances.

A solution of sodium picrate to which colloidal palladium has been added absorbs hydrogen, the picrate becoming reduced to triaminophenol. The absorption is not very rapid, the solution froths very badly, and is very expensive. Oxygen, unsaturated hydrocarbons, and carbon monoxide must be removed first. The latter gas "poisons" the catalyst—palladium—and so prevents the absorption taking place. Some of these defects can be overcome by means of a pipette specially designed for use with this reagent.

(*b*)—Non-Absorbable Constituents.

It will be gathered from the above that in the sense that absorption is uncertain or inexact, the constituents hydrogen and carbon monoxide should preferably be classed together with methane and nitrogen as non-absorbable constituents, and are preferably estimated by some process of combustion. A brief examination of these combustion processes follows:—

(1)—Explosion Methods.

The gas is mixed with a measured excess of air or oxygen and exploded by an electric spark. It is a matter of common knowledge that explosion methods are incapable of accurate results except in very skilled hands. Unless special precautions are taken, the combustion is often incomplete, and carbon monoxide, formaldehyde, oxides of nitrogen, hydrogen, &c., may often be found in the products of the explosion. The actual shape of the explosion vessel also has its influence upon the resulting products; and it is therefore obvious that the results of an explosion analysis are often totally unreliable. The combustion of the inflammable gases is instantaneous, and it is impossible to rectify any incomplete combustion by further treatment.

[The above statements must not be taken to imply that with great experience, and after repeated blank experiments, accurate results cannot be obtained by explosion.]

(2)—Fractional Combustion Methods.

The operation of fractional combustion is performed by passing the mixture of the inflammable gas over an oxidizing agent, which, when heated to a low temperature, effects the oxidation of one or more of the constituents (hydrogen and carbon monoxide); methane being determined by oxidation at a considerably higher temperature. Various oxidizing agents have from time to time been proposed by different experimentalists; but cupric oxide is the only one which has so far proved satisfactory in practice. If a mixture of hydrogen, carbon monoxide, methane, and nitrogen be passed over copper oxide heated to a temperature of 250° C., hydrogen and carbon monoxide are completely oxidized, but methane is unaffected. If the temperature be increased to a very bright redness, the methane also can be completely oxidized.

This method of analysis has been known for a very considerable period; but it is only recently that practical instruments for conducting this operation have been designed. A very good form of apparatus is that due to Taplay, a full description of which appeared in the "JOURNAL" last year [see Vol. CXVIII., pp. 217, 285]. In this instrument hydrogen is estimated by combustion over copper oxide at a low temperature, methane is oxidized at a high temperature, the residual gas is measured as nitrogen.

The drawback to this method of oxidation is that it is sometimes a matter of considerable difficulty to effect complete oxidation of the methane. It is a matter of common knowledge that in carrying out certain nitrogen estimations in an orgauic substance by combustion over copper oxide, some methane can escape oxidation and be recorded as nitrogen. It is, therefore, necessary to pass the gas backwards and forwards over the heated copper oxide for some considerable time. Nevertheless, the use of this method constitutes, in the author's opinion, a considerable improvement on the explosion method for ordinary purposes.

(3)—Slow Combustion Methods.

The method of slow combustion is performed by bringing the combustible gases, together with excess of air or oxygen, in intimate contact with a wire or tube on the surface of which combination takes place comparatively slowly and without explosion.

(*a*)—*The Winkler-Dennis Combustion Pipette.*—This consists of an ordinary Hempel pipette into which a platinum spiral, which can be heated electrically, is introduced. The contact of the gas with the heated spiral is not intimate, and it is difficult to burn the last traces of methane. In addition, unless the gaseous mixture is passed very slowly into the pipette it is likely to explode. The latter difficulty can, however, be obviated by adding the oxygen slowly as required. In small combustion pipettes of this type—as used on some instruments for the examination of the air of mines, trouble is invariably caused by the cracking of the glass in which the leading wires are fused.

(*b*)—*Drehschmidt's Platinum Capillary.*—This is a platinum capillary tube, 10 centimetres long, 2 or 3 millimetres in diameter, and 0·7 millimetre bore, which is filled with a few fine platinum wires. The ends of the tube terminate in two cooling jackets, which are filled with water. When a combustible mixture is passed through this tube, heated to bright redness by a bunsen flame, it is completely burned, without any risk of explosion. This platinum capillary affords a very convenient method of analysis, but is open to criticism on the following grounds: (1) It is very expensive. (2) It is rather slow, as it has to be cooled before readings can be made. (3) The external heating with a gas-flame is liable to introduce temperature errors.

It is possible to replace the platinum capillary by one composed of fused silica. This disposes of the first objection, but not of the other two.

(*c*)—*The Silica-Platinum Combustion Capillary.*—The author has been engaged in experiments, which have extended over a considerable period of time, on a new type of oxidation capillary tube designed to eliminate the various defects referred to above. The

following is a description of the form of tube, which numerous experiments have proved to be absolutely suitable and efficient. A B is a tube of fused silica about 7 mm. external diameter and 1·5 mm. bore. C D is a wire composed of an alloy of platinum with 30 per cent. of iridium. This is stretched axially along the silica tube A B. The leading-in wires E C and F D are made of molybdenum, as this is the only metal which can be satisfactorily fused into silica. The molybdenum wire, being very brittle, terminates at E and F in solid lumps of lead to which copper wires are soldered. G and H are leading-in tubes of silica, about 1 mm. bore, which serve to pass the gas through the tube A B and over the wire C D. The latter is heated by a current supplied from a two-volt or four-volt battery, and its temperature is easily regulated by means of resistance which is included in the circuit.

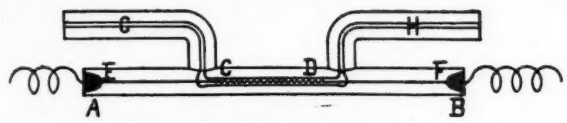


Fig. 1.—Silica Platinum Capillary Tube.

The wire itself is corrugated, so as to take up the expansion on heating; otherwise it sags against the sides of the tubes and does not heat-up properly. If a pure platinum wire be employed, the same end is achieved by the insertion of a small molybdenum spring. The increase of length on heating is very marked when the temperature of the wire is increased to whiteness; as the coefficient of expansion appears to increase very rapidly with the temperature above a red heat. At first, pure platinum wire only was employed; but this is advantageously replaced by the alloy, for two reasons. Firstly, pure platinum is much softer. It undergoes a permanent extension, and is also rather liable to fuse by overheating. Secondly, as the resistance of the alloy is the greater, it is possible to use a stouter wire with the same current, and thus improve the durability.

The contact of the gaseous mixture with the heated wire is very intimate, and therefore the combustion is rapid and complete. The temperature of the wire is very easily regulated, as the latter is always visible. There is not the slightest tendency for the silica tube to crack; for, as is well known, owing to its extremely low coefficient of expansion, red-hot silica can be plunged into cold water without deterioration. It can also, if desired, be surrounded by a water-jacket, so that the temperature of the gas is unaltered. The leading-in tubes G and H are arranged so that the combustion tubes can be completely filled with mercury, in order to sweep out all traces of gas.

This combustion tube has been embodied in two new instruments, designed for the examination of the air of mines according to the provisions of the Coal Mines Act, 1911. These instruments were described in a paper read before the Society of Chemical Industry in December, 1912.

Use of the Silica Platinum Capillary.

The silica platinum capillary tube can be used in two ways for the complete estimation of a mixture of hydrogen, carbon monoxide, methane, and nitrogen.

(1) *Complete Combustion Method.*—A few c.c.'s of the gaseous mixture, after the removal of the absorbable constituents, together with excess of air or oxygen, are measured and then passed through the oxidation tube, the temperature of which is regulated to incipient whiteness. By excess of air is meant (say) nine times the gas volume. This operation is repeated once or twice, until no further contraction is observed. The maximum contraction is noted. The gas is then passed into a potash pipette to remove the carbon dioxide produced by the combustion, and the further contraction is noted. The excess of oxygen is now absorbed in a pyrogallate pipette; thus giving a measure of the amount of oxygen required for the combustion. [This, of course, presupposes a knowledge of the amount of oxygen added, which is known from the composition of the gas added.]

Let the volume of carbon monoxide be x.
" " " methane be y.
" " " hydrogen be z.

Then C_1 = contraction $= \frac{x}{2} + 2y + \frac{3}{2}z$

" C_2 = contraction in potash $= x + y$

" V_0 = oxygen used $= \frac{x}{2} + 2y + \frac{z}{2}$

Solving these three equations for x, y, and z, we have:—

x = carbon monoxide $= \frac{4C_2 + C_1 - 3V_0}{3}$

y = methane $= C_2 - x$

$\left(\text{or } y = \frac{3V_0 - C_1 - C_2}{3}\right)$

z = hydrogen $= C_1 - V_0$.

(2) *Fractional Combustion Method.*—The author has found that, by regulating the temperature of the heated wire, the hydrogen, carbon monoxide, and methane can also be determined by fractional combustion. If the wire be heated to scarcely visible redness, the hydrogen, and occasionally some of the carbon monoxide, is burnt, while the methane remains unaffected. On increasing the temperature to incipient whiteness, the remainder of the carbon monoxide and the whole of the methane are oxidized. The advantage of this method of working is that the accuracy of the determination of the combustible gases is increased, and the necessity for the determination of the oxygen consumed is obviated. The method of working is as follows: The gaseous mixture is passed over the wire (which is heated to scarcely visible redness) a few times until no further contraction is observed. The gas is then passed into potash, and the amount absorbed, if any, is noted.

Let the contraction be C_1 and the further contraction on passing into potash be C_2. Then the carbon monoxide oxidized at this stage $= C_2$. The contraction due to carbon monoxide $= \frac{C_2}{2}$. Hence the contraction due to hydrogen $= C_1 - \frac{C_2}{2}$ and hydrogen $= \frac{2}{3}\left(C_1 - \frac{C_2}{2}\right)$. After heating to whiteness, let the further contraction observed be C_3, and the contraction on passing into potash be C_4.

Let the remainder of the carbon monoxide be x and the methane be y. Then $C_3 = \frac{x}{2} + 2y$ and $C_4 = x + y$. Hence y = methane $= \frac{2C_3 - C_4}{3}$, and x = carbon monoxide $= C_4 -$ methane.

Hence hydrogen $= \frac{2}{3}\left(C_1 - \frac{C_2}{2}\right)$

methane $= \frac{2C_3 - C_4}{3}$

carbon monoxide $= \frac{C_2}{2} + C_4 -$ methane.

Usually it will be found that no contraction is observed on passing into potash after the first combustion—*i.e.*, $C_2 = O$.

C_2 should be determined as a check, in case some carbon monoxide should be oxidized together with the hydrogen.

The complete combustion method is more rapid than the operation described, as only one combustion and absorption in potash are required. On the other hand, however, it entails a measurement of the oxygen, which the fractional method does not.

The complete combustion method is most suitable for use in a constant volume apparatus (*Q.V.*); whereas in instruments in which measurements are made at constant pressure, the fractional combustion method is far preferable.

(To be continued.)

"COLD LIGHT."

PROFESSOR DUSSAUD'S ELECTRICAL DISCOVERY.

By A. M.

"An invention which promises to revolutionize conditions of electric lighting"—to quote the "Evening News"—was during the past week demonstrated in London by the inventor, Professor Charles François Dussaud, of Paris. The leading daily journals, as a whole, have reviewed the idea with something approaching enthusiasm—heralding it as a discovery which will bring domestic lighting by means of electricity within the reach of all who may desire it. Under the circumstances, it was with particular gratification and interest that the writer was permitted to be present at one of the recent exhibitions.

It should primarily be explained that the term "cold light" is applied owing to the fact that the system employed prevents the emission and radiation of heat from the luminous source. It is, of course, well known that the heat emitted by the ordinary electric arc is intense; but Dussaud claims that his invention entirely eliminates this undesirable effect. To the ordinary student of electro-physics, it may, perhaps, seem somewhat anomalous that brilliant light may be obtained apart from the production of a corresponding amount of heat; and it would appear that the invention has rendered standard physical laws of a somewhat questionable nature. The underlying principle of "cold light" is the adaptation of the law of rest and effort, so well illustrated by the rules governing the existence of ourselves. In the same way that man enjoys relaxation after a certain period of toil, so is the lamp in this system permitted a fractional period of rest after momentarily exerting its brilliance. To grasp the whole system it is merely necessary to imagine an ordinary filament lamp switched on and off between forty and sixty times during a second. Under such conditions, it is stated that as soon as heat is generated it is very quickly dispersed; and accordingly the glass bulb remains perfectly cold. This property of the invention is justly claimed to be advantageous in assuring perfect immunity from fire and other risks when lamps are used for cinematograph and certain medical purposes. The foremost merit of the invention, however, lies in the promised reduction in the electric lighting bill when the system is applied domestically. Here, indeed, is a study in practical economics; for (we are told) the saving in current will be no less than 93 per cent.!

The principle of interruption is utilized in two ways. Either a single lamp may be used, or three or more lamps mounted in a ring which is rotated in such a way that each comes successively

into contact and is momentarily burning. The rate of rotation is so high that to the human eye the period of rest is imperceptible. Consequently, an effect of continuous illumination is gained. Furthermore, ordinary metallic filament lamps are employed; but a considerable increase in illumination is obtained by sur-voltage. Thus an ordinary 8-volt lamp may be connected to a 16-volt (or even higher) supply, and a correspondingly greater candle power is derived from it. This effect of sur-voltage is, of course, by no means a novel idea in electrical science; and it has not hitherto been employed owing to the disastrous effect it has on the life of the lamp. For instance, with continuous lighting with high sur-voltage a 1000-hour lamp may be rendered worthless at the end of a few minutes.

The experiments designed to set forth the virtues of the idea were, perhaps, scarcely convincing; and it would appear that considerable advancement will have to be made before the industry is "revolutionized." Firstly, the audience were shown views thrown on to a screen by means of the ordinary arc-lamp. The same effect was then produced by the "Dussaud" light. To demonstrate the practical saving of current, special measuring instruments were fitted; and the writer noted the following data:—

With electric arc: Volts, 109; Amps, 10 ; Watts, 1090
" "Cold Light:" " 17; " 1½; " 25½
Saving in current, 1064½ watts.

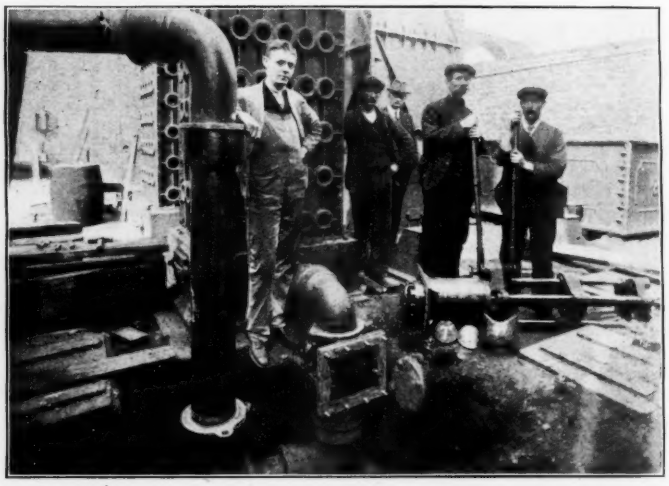
These, of course, are alluring figures—showing untold economy in current; and it was unfortunate that an electrical expert present discovered a "choker" in the supply to the arc. With this removed, it was suggested that the requirements of the arc would be approximately 300 watts—thus reducing the above saving by 75 per cent. It was more unfortunate still that on this occasion the inventor was unavoidably absent, as his experience would have been useful in explaining what seemed to be beyond the powers of his deputy. It cannot be denied, however, that from the current standpoint the results were eminently satisfactory; and from the electricians' point-of-view it is to be regretted that other outlays have to be taken into consideration. According to the presiding demonstrator, the life of the lamps employed was reduced from one thousand hours to about four hours, owing to the high voltage applied to them. Furthermore, such lamps at the present time are listed at 1s. each, although it is said that, with increased demand, they could be retailed at 8d. From the experiments performed and the data recorded, the writer was enabled to draw up the following comparison:—

(*a*) With arc lamp.
Current for four hours (300 × 4) = 1200 watt-hours = 1·2 units.
Taking current at 3d. per unit.
Current charges . . . . 3·6d.
Carbons . . . . . 0·25d. Total 3·85d.

(*b*) With "Cold Light."
Current for four hours (25 × 4) = 100 watt-hours = 0·1 unit.
Current charges . . . . 0·3d.
Lamp (four hours' life) . . 8·0d. Total 8·3d.

From the above it will be seen that, although the saving in current for four hours amounts to 3½d. as compared with the arc, the additional lamp charge is as much as 7¾d. Under the circumstances, it is evident that the claims to economy are open to discussion, and that the main effect of the invention will be to transfer the custom from the generating concern to the lamp manufactory.

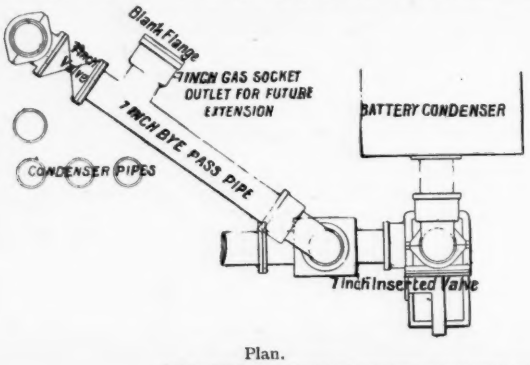
A NEW METHOD OF INSERTING VALVES ON LIVE MAINS.



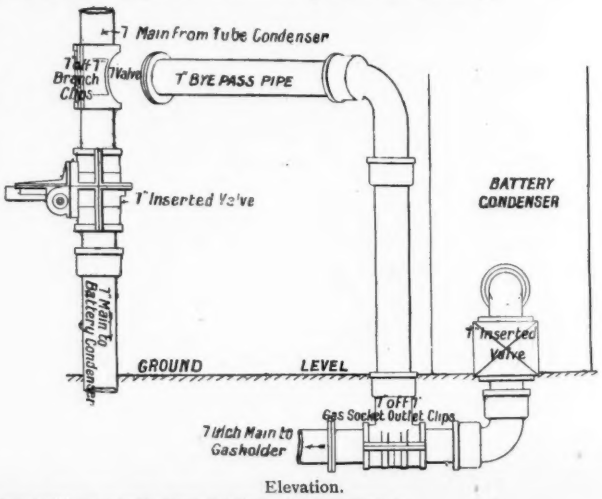
Some particulars and illustrations of a novel little piece of work lately carried out for the Whitby Gas Company have been forwarded by Mr. W. M. Galleway, the Secretary and Manager.

It was desired to bye-pass the battery condenser, and to do so without having to shut-down any portion of the plant or incur any loss of gas; and the manner in which this was accomplished is briefly explained. On the 7-inch pipe leading from the tube condenser to the battery condenser, a 7-inch connection was taken off (as shown in the first photograph), by the usual under-pressure methods; and underneath this, on the same length of pipe, a Ruscoe patent inserted valve was fixed, but was left with the gate open, so that the flow of gas was uninterrupted. An essential feature of this valve is that a gas-tight metal-to-metal joint is obtained between the valve-gate and its seating, so ensuring a perfect joint. Another valve was then inserted near the outlet of the battery condenser; and a 7-inch branch was taken off the main leading to the exhauster. This will be seen at the bottom of the second photograph. The two 7-inch branches were coupled-up with the bye-pass pipes, and all the joints made good. The bye-pass valve was then opened, and the two inserted valves were closed—thus cutting out the battery condenser. The general arrangement of the pipes is indicated by the outline sketch; and with regard to the second photograph, it may be pointed out that pieces cut from the mains are shown in front of the valve-inserting machine, as well as one piece held in the cutters of the machine. The inserted valve is also seen immediately after the machine and piece have been removed, with the face prepared to receive the valve-gate and bonnet.

The work (which was done by Messrs. John Ruscoe and Co., Limited, of Hyde) has proved quite satisfactory, and interest attaches to it from the fact that it is stated to be the first time the method detailed has been adopted in this country.



Plan.



Elevation.

ARRANGEMENT OF INSERTED VALVES, &c., FOR BYE-PASSING THE BATTERY CONDENSER.

HUMPHREY INTERNAL COMBUSTION PUMPS.

At the Royal Institution last Saturday, Mr. H. A. Humphrey, M.Inst.C.E., gave the first of two lectures on the subject of his internal combustion pump.

The lecturer pointed out that the history of the branch of engineering which deals with the production of power is largely a record of the complications and refinements which have been added to obtain increased efficiency. A comparison of the simplicity of the early steam-engines with a modern triple-expansion engine, with its superheater and condenser and all the gear involved, sufficiently emphasizes this point; but the remark applies equally to gas and oil engines. The most notable return to simplicity of construction is found in the steam-turbine; and the rapid attainment of this prime mover to the premier place among its rivals is largely due to its simpler construction. In recent times, probably no combination of well-known principles has produced so simple a method of utilizing the energy of combustion as that found in the Humphrey pump; and the widespread interest it has created is due to this fact and to the improved thermal cycle which it employs. Doubtless this aspect of the subject was in the minds of the Institution Committee when they honoured the author by inviting him to deliver these lectures.

Mr. Humphrey then gave a brief review of apparatus using gas explosions in contact with water, from the date when Pierre Martin filed a provisional specification in 1858. This specification is so short that it may be reproduced:

> My invention consists in obtaining motive power from the explosion or dilatation produced by the combustion, by means of the electric spark, of a mixture of combustible gas and air, or by the combustion and decomposition, by the electric spark, of combustible gas, air, and water vaporized. The gases or vapours may be employed to produce motive power in the same manner as steam is now or may be applied.

The development of the idea was traced by records of patents taken out in this country and abroad; and it is interesting to note that a considerable number of these were concerned with the propulsion of ships. They were, however, mostly very crude in design, being quite impracticable. Backeljau seems to have been the first actually to make an explosion pump for lifting water; but the most scientific work was done by Adolf Vogt, a clever German, who came nearer to success than any of his predecessors. In Vogt's apparatus, an explosion drove water into a high-pressure air-vessel from which it passed through a water-turbine doing work, and then back to a low-pressure air-vessel. From the latter the water was returned to the apparatus under such conditions that it compressed a fresh combustible charge.

The lecturer then explained why the previous efforts had all failed, and showed that, even when the inventor had recognized the necessity for compression of the charge before combustion, the pump had been designed too much on the lines of ordinary pumps with water-delivery valves, and that valves which have to be opened or closed suddenly by explosion are so affected by shock that they cannot last.

To illustrate the new principles involved in the Humphrey pump, the simplest form of the pump was described. It is of a type which has been made large enough to deliver 20 tons of water per explosion, or (say) 200 tons of water per minute, and units capable of discharging 50 tons of water per explosion have been designed.* In connection with this four-stroke cycle pump, the lecturer pointed out that among the novel features which were embodied, there are—

1.—The column of liquid swings absolutely freely backwards and forwards and its momentum completely controls the cycle.
2.—When the explosion occurs, all the valves are shut, and no valve moves except under the slight pressure changes above and below atmospheric pressure. There is therefore no shock on the valves, and they are thus permitted to work smoothly.
3.—The momentum of the outwardly propelled column of liquid is utilized to draw in both fresh combustible charge and fresh water.
4.—The momentum of the liquid returning under its head or pressure compresses the fresh combustible charge.
5.—As the height of lift increases, the compression pressure increases, so that the pump is assisted to meet the greater duty, and the pump becomes self-regulating.
6.—The length of the column is proportioned, so that the maximum velocities are limited to those found desirable, and the frictional losses are therefore very small.
7.—The four strokes of the cycle are all of unequal length, as theory requires; and the thermodynamic efficiency of the cycle is therefore superior to that of the Otto cycle, in which all the strokes are necessarily of equal length.

It was of this type of pump that Dr. W. Cawthorne Unwin, F.R.S., said: "The results are very remarkable; the fuel consumption in these trials, reckoned on the work done in lifting water, was less than any pumping arrangement, either by gas or steam, hitherto recorded."

* The Humphrey pump has been described and illustrated in the "Journal" on several occasions; the most recent being in the last volume (pp. 252, 757).—Ed. J.G.L.

The various forms taken by the pump to meet different conditions of operation were next described by the lecturer, and an explanation was given of some of the theoretical considerations involved, as, for instance, the relation between the speed of working and the dimensions of the play pipe in which the water oscillates, also the relation between the compression pressure of the charge and the height to which the water is pumped.

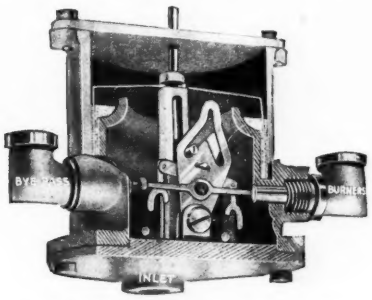
Numerous other two-stroke and four-stroke cycle types of the pump were then illustrated by lantern slides, as well as the ingenious mechanism by means of which the operation of the valves is secured, and the necessary electric firing by sparking plugs is obtained. As those who have followed the description of the pump are aware, the devices for these purposes are very simple and compact, and for their action depend entirely upon pressure changes in the apparatus.

The means adopted where Humphrey pumps have to work with a suction lift, or under conditions of lift far exceeding those which the simplest type of pump can deal with, were explained. Like the pump itself, the intensifier used by Mr. Humphrey in obtaining high lift has no working part except simple automatic valves, and lifts up to 200 and 300 feet have with this appliance been satisfactorily dealt with.

The lecture was illustrated by forty lantern slides.

THE FOSTER PATENT GAS-CONTROLLER.

Of quite simple design is the Foster patent automatic lighter, the function of which is to automatically light and extinguish street gas-lamps. By its aid, it is possible to turn on or off any number of lamps at will, by station control. One of the points urged in its favour is that at the actual time of lighting either the bye-pass or main burner, both can be kept burning as long as the operator wishes. After the lapse of a few seconds—just long enough to ensure certain ignition of the gas at these points—either one or other will close-down automatically. This overcomes any objection to the effect that, to make certain of the burner lighting, the bye-pass has to be burned continuously. If a permanent bye-pass were substituted, then the controller could work a cluster of lamps when desired to only run a part during quiet hours and the whole during busy times. It is claimed that it will work under as low a difference of pressure as any controller on the market.



The Foster Lamp Lighter and Extinguisher.

The complete apparatus, which is only 3 inches in diameter and 3½ inches high, is either placed within the lamp standard or close to the lantern, whichever is the more convenient. Instead of the supply being connected direct to the burners or mantles, it passes to the inlet of the lighter. So long as the pressure is normal, the balanced valve-lever, at either end of which is a valve, will remain stationary—*i.e.*, with one or other valve closing the entrance to either the bye-pass or the supply-pipe. On the pressure rising above the determined level, the diaphragm, which floats upon a mercury seal, will be lifted, taking with it the spindle to which it is attached. About half-way up this spindle a metal pin projects at right angles; and this engages in the inverted Y slot in the diamond-shaped front plate. The bottom of this plate is pivoted near the base of the regulator. The plate also carries the valve-lever.

At the back of the diamond plate is a piece of metal with two arms bent backwards at right angles; and these arms have pivoted at their ends two small metal crutches. On the spindle being raised, the pin travels up the slot. This brings the front plate into a vertical position; and when the pin is nearly at the end of its travel, the lower crutch at the back is engaged with the arm at the bottom of the spindle, and is lifted upwards. This throws the metal tongue behind the diamond piece over to the opposite side, so that when the pin descends it has to follow the opposite groove to which it was in before.

The movement of the diamond plate, of course, regulates the opening and closing of the two valves. When one is open, the other is shut, or the two are open together. It will therefore be gathered that, when it is desired to light the lamps to which the regulator is attached, all that is necessary is to momentarily increase the pressure to the predetermined level. This, by lifting the diaphragm, will open the valve closing the main supply, and permit the gas to reach the mantles. As long as the increase in

pressure lasts, both mantles and bye-pass will be alight. Directly the pressure is reduced to normal, the diaphragm will descend and close the valve leading to the bye-pass. Conversely, should it be necessary to put out the lamps, the pressure is raised in the same way as before; and, as the diamond piece is thrown over to the opposite side, the main supply will be closed, and the bye-pass opened. From the foregoing, it will be seen that, though at the moment of operation both the bye-pass and the main supply are open, when the pressure settles down and the lights are in operation the bye-pass is cut-off, with a consequent saving in gas.

The Foster Engineering Company, of Wimbledon, S.W., are the sole manufacturers of this device, an illustrated abstract of the patent specification for which was given in the "JOURNAL" for Oct. 15 last (p. 235).

INFLUENCE OF COPPER ON THE CORROSION OF IRON AND STEEL.

In the "JOURNAL" for the 1st ult. (p. 34), we reproduced from the "Transactions" of the American Gas Institute a short paper read by Mr. G. F. Ahlbrandt, of Middletown (Ohio), at the last annual meeting, on "Pure Iron *v.* Steel for Gasholder Construction." The author gave the results of weather tests on the resistance to corrosion in sheets of open-hearth steel and those of pure iron made in the same type of furnace. These tests showed a very much higher resistance to corrosion on the part of the iron sheets during 16 months' exposure, and were interpreted as indicating that the steel sheets were really destroyed by electrolytic action between the metal base and the electro-chemically diffusing impurities. As showing the durability of pure iron, slides were exhibited of specimens said to be at least five hundred years old, and of links from a chain bridge known to have been built more than a hundred years ago. In the discussion on the paper, mention was made of the occurrence of copper in some of these old specimens, and of its possible influence on corrosion. Exhaustive tests, covering a period of more than a year, have just been reported by Mr. D. M. Buck to the American Chemical Society. They were made to compare the corrosion of sheets of regular basic open-hearth steel, basic open-hearth dephosphorized steel, regular Bessemer steel, pure iron, and specimens of the three sheets with an added copper content of from 0·15 to 0·25 per cent. The tests were made with unpainted corrugated sheets of full size, built into shed roofs—one erected in the Pennsylvania coke region, where the air contains appreciable amounts of sulphuric and sulphurous acids; one on the seacoast, where the air carries sodium chloride; and one in a rural district, where the air is quite pure. The analyses of the specimen sheets were as follows:—

	C.	Mn.	S.	P.	Cu.
1.—Open-hearth steel	0·10	0·34	0·034	0·019	—
2.— ,, ,, dephosphorized	0·13	0·45	0·036	0·042	—
3.—Bessemer steel	0·08	0·46	0·070	0·096	—
4.—Pure iron	0·02	0·03	0·034	0·003	0·06
5.—No. 1					
6.—No. 2 } with copper added in ingot.					
7.—No. 3					

After seven months' exposure in the coke region, Nos. 1, 2, and 3 were failing and falling off, having rusted through; four months later, Nos. 1, 2, and 3 had entirely disappeared; No. 4 had failed to the extent of the sheets dropping off; Nos. 5, 6, and 7 (the copper-bearing sheets) were still intact. After another three months, No. 4 had entirely disappeared, and Nos. 5, 6, and 7 were still in place.

Commenting on electrolytic action, Mr. Buck says: "It is a well-known fact that copper is electro-negative to iron, and that, when placed in contact with it, it will stimulate corrosion in the latter. That the reverse is true when the copper is alloyed with the iron, and in solid solution in the crystal grains, may be due to the alloy taking in a measure the non-corrosive properties of the copper. It also appears that the alloy of copper and iron may be less electro-positive to the first film of rust formed than is the non-copper steel, and that the consequent decrease in difference of potential may lessen corrosion."

Referring to these tests, the "American Gaslight Journal," from which they were taken, says they would seem to show that a small copper content adds materially to the life of steel sheets, and renders them even more durable than those of so-called pure iron. Users of tin-plate sheets and wrought pipe are materially interested in any processes that will add to the durability of manufactured iron.

Mr. J. R. Bibbins, as assignor to the Colonial Trust Company of Pittsburgh (Pa.), has taken out a patent for the United States for a calorimeter. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the thermal units developed in the instrument are indicated by an electrical device—a variable resistance in combination with a source of constant potential. The variation in the resistance, which consists of a tube containing at one end a liquid of high resistance and at the other a liquid of lower resistance, is obtained by altering the relative proportions of the two liquids. This is effected by means of sensitive liquid thermometers.

INSTITUTION OF WATER ENGINEERS.

Programme of the Summer Meeting.

The Eighteenth Summer General Meeting of the Institution of Water Engineers will be held at Wakefield from the 5th to the 7th prox., under the presidency of Mr. C. Clemesha Smith, M.Inst.C.E., the Corporation Water Engineer. We learn from the circular issued by the Secretary (Mr. Percy Griffith, M.Inst.C.E.) that, by permission of the Mayor and Corporation, the meetings will be held in the Town Hall, and that at the opening of the proceedings the members will be welcomed by his Worship (Mr. Edwin Lodge Hirst, J.P.). The President will deliver his Inaugural Address; and the following papers have been promised for reading and discussion:

"The Valuation of Water Undertakings on Transfer to Local Authorities," by Mr. E. J. Silcock, M.Inst.C.E. (held over from the winter meeting).

"The Water Supply of Jersey," by Mr. Alfred J. Jenkins, Assoc.M.Inst.C.E.

"Animal Growths in Water-Pipes," by Mr. Samuel C. Chapman, M.Inst.C.E.

"Reservoir Storage in Relation to Stream Flow," by Mr. W. J. E. Binnie, B.A. (Cantab.), M.Inst.C.E., and Dr. Herbert Lapworth, M.Inst.C.E.

The President will supply an illustrated description of the Wakefield Water-Works; and a lecture will be delivered by Professor Percy Kendall, F.G.S., on "The Underground Waters of the Lower Kendal."

On the afternoon of the opening day, the members will visit the Kirkhamgate filtration works and the Ardsley reservoir of the Wakefield Corporation Water-Works. In the evening there will be a reception at the Town Hall on behalf of the Corporation. On Friday, June 6, a visit will be made to the Green Withens and the Ringstone reservoirs (Rishworth Moors); and in the evening the annual dinner will be held in the Banquet Chamber of the Town Hall. At this function, the Mayor and other distinguished guests will be entertained by the Institution. On Friday, luncheon will be provided by the Water Committee of the Corporation; and on Thursday and Friday afternoons, tea will be available (by invitation) for those taking part in the visits arranged for those days.

PHYSICAL PROPERTIES & HARDNESS OF COKE.

In the number of "Glückauf" for March 1 appeared an interesting communication on this subject by Herr O. Simmersbach. He remarks that the usefulness of coke depends to a large extent on its nature, and hard coke will burn twice as long as soft. Therefore, quite as much attention should be paid to the physical properties as to the chemical. The coke need not, however, be so hard as might be expected, in order to bear the load of a charge in a large smelting furnace. The author estimates it in a large furnace 80 feet high at about 42·6 lbs. per square inch. From a chemical point of view the ash and silica contents of the coke count the most; the more silica it contains, the less firm it is. It is at its worst with 44 per cent. of SiO_2 in the ash. From his investigations the author comes to the conclusion that it is more important for the coke to be able to withstand frictional forces than crushing, because in smelting furnaces the particles which are rubbed off the coke by friction form thick masses, which impede the proper working of the furnace. Therefore coke which crumbles easily can only be used in small smelting furnaces. In the case of screened coke, it was found that the water content of the fine coke was very much higher than that of the larger pieces; likewise the ash content was 30 to 40 per cent. more, and the sulphur content 20 to 30 per cent. more, in the small stuff which had crumbled from the larger pieces. The following table is interesting, showing results of analyses of various samples carried out by the author.

	Foundry Coke.					Screened Fine Coke (7 per cent.).				
	Water.	Volatile Substances.	Carbon.	Ash.	Sulphur.	Water.	Volatile Substances.	Carbon.	Ash.	Sulphur.
1.	1·81	1·12	89·18	9·70	0·75	10·78	4 82	80·42	14·76	0·90
2.	1·79	1·19	89·03	9·78	0·74	10·51	6·21	81·20	12·58	0·89
3.	2·03	1·22	89·12	9·66	0·79	10·43	6·77	82·12	11·11	0·90
4.	2·04	1·47	88·71	9·82	0·79	10·08	7·23	80·75	12·02	0·87
5.	1·46	1·31	88·76	9·93	0·87	7·87	9·39	78·06	12 55	1·01
6.	1·30	1·01	89·03	9·96	0·82	6·72	8·11	79·35	12·54	0·99
7.	0·97	1·68	88·05	10·29	0·77	13·10	5·88	79·25	14·87	1·04
8.	1·50	2·02	87·29	10·69	0·84	12·37	6·65	78·47	14·88	1·02
	Smelting-Furnace Coke.					Screened Fine Coke.				
9.	1·02	1·54	87·91	10·55	0·76	15·30	5·27	80·77	13·74	0·80

It was further found that softer (easier crumbling) coke is more easily disturbed by carbonic acid in its downward motion. Damping of the coke at the furnace mouth does no good, as the water evaporates too soon, and so offers no protection.

GAS POWER IN MILLS.

Conference of the Textile Institute at Manchester.

In connection with the annual general meeting of the Textile Institute, held at the Midland Hotel, Manchester, on Friday, the 2nd inst., a conference took place on "Textile Mill Driving." About seventy members were present; and, in the absence of the President of the Institute (Lord Rotherham), the chair was occupied by Mr. F. R. M'Connel (Chairman of the Manchester Sectional Committee). The subject was divided into four parts; the speakers being announced in the following order: (1) Steam Driving, Mr. G. B. Storie, of Rochdale; (2) Gas Driving, Mr. T. Roland Wollaston, M.Inst.M.E., of Manchester; (3) Oil Driving, Mr. F. Carter; and (4) Electric Driving, Mr. J. Francis Crowley, B.A., of Manchester. The object of the meeting was to carry on the work of a Special Committee of the Textile Institute—the duty of that Committee being to make periodical reports to the Council of the Institute upon the various methods of mill driving, as well as upon improvements and developments in this or any other country. It was an important subject; and it was fitting that the Institute should have recognized this by the appointment of what was now practically a Standing Committee to guide them and watch over the matter.

Mr. Wollaston had a hearty reception on rising to take up the argument in favour of gas driving. He began by remarking that he had not prepared anything new to say to them. Members would, perhaps, have read his previous remarks on the subject;* and in order that the question might be further ventilated, he would deal with some of the criticisms advanced in opposition to the installation of gas-engines in textile mills. The objection that gas-engines were sometimes uncertain in starting arose out of early experience with engines fitted with so-called self-starters. The self-starter had given place in plants of any size to independent compressed air starting, which rendered the gas-engine as easy to start as any steam-engine. The second objection was the alleged difficulty in maintaining a steady quality of gas, both as regarded composition and cleanliness. "This was largely founded upon experience with suction plants." Good plant of the positive type—the word "positive" being used to differentiate from those depending wholly upon engine suction—presented no difficulties, if worked with reasonable intelligence, in maintaining the composition of the gas constant. It was quite easy to obtain a steady quality of gas, if the plant were properly designed and controlled. Gas-power plants were said to be more costly in the first instance than steam. Comparing the bare cost of gas engines and plants with the cost of steam engines and boilers, this might be correct. There were, however, many adjuncts to the steam set, which almost invariably brought the price up to, or near, that of the gas set. Mr. A. E. L. Chorlton, of Manchester, in a paper read before the Manchester Society of Engineers in 1910-11, went to great pains to check estimates; and his conclusions (substantially confirmed by his own experience) were to the effect that, for plant as required by a modern textile mill, there was little difference in first cost between gas and steam, when all apparatus was taken into account. Recent improvements, however, in gas engine and plant design, combined with the ever-increasing output of the leading makers, were tending to lower prices. As to the contention that there was liability to breakdown, due to high internal temperatures and cylinder cracks, it was admitted there had been such failures; but the percentage of such accidents was getting lower year by year.

The regularity of turning with gas-engines was sometimes said to be insufficiently good for spinning mills; but this statement was based wholly upon what may now be regarded as the ancient history of single and double cylinder single-acting four-cycle horizontal engines. During thirty years' experience with cotton-mill engines, the best turning he had ever seen was by a gas-engine. Another criticism was that gas-power plants required more room. For small powers, this was not true. Of course, more space was required than for Diesel or other oil-engines, but less than for steam-engines, with their boilers and adjuncts. For large powers, with pressure bituminous gas plant, a somewhat larger area was sometimes needed; but the gas plant was composed of parts which could be coupled together in so many different ways that it was frequently possible to arrange the plant on space impossible of utilization for boilers of any kind. It required practically no housing, and the cheapest and simplest of foundations. An important point, too, was that distance apart of gas plant and engine was of no consequence. Again, there was no condensation loss to consider, and gas-mains were cheap. With so many reliable designs now available, the engine-house dimensions need not exceed those required for steam or Diesel engines.

On the question of general reliability, Mr. Wollaston said he could not do better than refer to a published report of the performance of the Westinghouse engine and Mond gas plant at Hollin's Mill, Marple. This, he believed, was as supplied by Mr. Hodgkinson, the Managing-Director, to whom all manufacturers of gas power plant and all textile economists were indebted for pioneer work in this important subject. The report stated that "the operatives' opinion is unanimously to the effect that the drive is steadier with the gas-engine and rope-drive than it was with the steam-engines and geared-shafting which were displaced. The starting is accomplished by compressed air at 300 lbs. per square inch pressure, which is admitted to the lower cylinders. The compressed air is stored in six tanks, and is furnished by a direct steam-driven Reavell quadruplex compressor, which averages only twenty minutes running per diem. Turning the air starting-valve, getting up speed, and throwing full load on the engine, is regularly accomplished in the remarkably short space of 20 seconds. During the past 21 months the engine has only twice failed to start-up at the first attempt, both times owing to bad gas. The reliability of the prime mover under review is unsurpassed by the great majority of steam-driven installations, since, during the 21 months, the almost incredible record of but one running stop has been put up. This stoppage was due to a faulty ignition-plug, and its duration was only a matter of a few minutes."

Turning to the features in which he claimed that gas power appeared to excel every other power for textile mill driving, Mr. Wollaston quoted the following from a previous paper of his:—

The fuel cost per brake horse power for the gas-engine as compared with that for a high-class steam-engine, is about in the ratio 5 : 9.

Comparing the gas-engine fuel cost with that of the Diesel engine, rating the former at 1¼ lbs. of coal and the latter at ½ lb. of oil per B.H.P. (prices respectively 11s. and 50s. per ton), we get—

Gas-Engine:		*Diesel Engine:*
1·25 × 11	:	0·5 × 50
say, 14	:	25

Steam is always required for one purpose or another in textile mills, however driven. There may be obtained at least 2 lbs. of steam per horse power driven from boilers coupled to the exhaust pipe of the gas-engines, and receiving their heat from the waste products of combustion. That is to say, if in the steam-driven mill 20 per cent. of steam is required for heating, additional to the power steam, in the gas-driven mill about 11 per cent. of this, or more than one-half, would be provided without extra coal, and substantially without attention.

Much of the balance of the heating steam can be raised by burning the tar produced under the boiler. Twenty-five tons of coal produce a ton of tar as an average, and a ton of tar will raise about the same amount of steam as a ton of coal.

Continuing, he said the stand-by losses in banking-up over week-ends and at nights were, in the gas plant, about one-quarter those of the average boiler-house. The Diesel engine, of course, excelled in this respect. Incompetency or carelessness on the part of the boiler-house staff, even when the boilers were fitted with mechanical stokers, frequently led to considerable loss in steam plant. Very few steam plants worked normally within 10 per cent. of their supposed standard of economy. Like carelessness could not affect the gas plant in the same way, because the stoking was a purely mechanical operation, performed as well by a novice as by an experienced man. The engineer in charge need only give very occasional supervision. The rate of gas production was, in well-designed producer plants, regulated automatically, and the efficiency fell away very little on low loads. When working under loads varying from 15 to 100 per cent., practically no extra care was required. The efficiency of the gas-engine on low loads was considerably higher than that of the steam-engine, and much higher than that of the steam-turbine. With the gas plant, there were no high pressures, no losses equivalent to pipe condensation, and no non-conducting coverings to provide and maintain. The quality of the water supply was of no importance, except as regarded the small amount for steam raising. The maintenance charges upon a well-managed gas plant were considerably lower than on the equivalent steam plant. Maintenance charges on gas-engines seemed very variable; but they average little (if any) more than those of the steam-engines.

Extraordinary Demand for Recovery Plants.

Mr. Wollaston concluded with a short reference to the advantages peculiar to gas-power alone—namely, bye-product recovery. He said he had had an extraordinary demand lately from spinning and manufacturing concerns for gas power up to 1000 H.P., with recovery plant. Shortly, the story was this: That for every ton of coal you put through the producers in a recovery gas plant, you get something like 90 lbs. of sulphate of ammonia, and this 90 lbs. of sulphate of ammonia is, roughly speaking, worth 11s. So that if you are buying coal at 7s. or 8s., and getting sulphate of ammonia at 11s., it looks a very beautiful proposition. When you get to a big scale, and put in a plant of 1000 H.P., and your producers are working ten hours a day, it is actually a fact that you are running the factory for nothing, in addition to getting

* See "Journal," Vol. CXIX, p. 826.

your power. This, of course, he added, applied to large installations, where the plant was put down in the first instance for making sulphate of ammonia, and the gas was a pure bye-product. It did not, however, pan-out so satisfactorily on a small plant.

He went on to say that a concrete example of what he referred to would be found in the Institute's "Transactions." This shows the cost-sheet of the Hollins Mill, Marple, for 1911, and is as follows:—

Running Cost.

*Coal—1100 tons, at 10s. 3d. per ton	£563 15 0		
Oil for gas-engine	110 2 10		
Oil for gas-plant auxiliaries	2 15 2		
Scrubber materials	1 0 0		
Packing for steam-engines	0 19 6		
Acid for recovery plant	55 0 0		
Repairs, renewals, &c., to engine and plant	5 4 6		
Wages	300 0 0		
		£1038 17 0	
* "*Adjustment*" *figures on above*—			
**Add* for 9d. extra on 1100 tons of coal	£41 5 0		
10 per cent. interest and depreciation on present cost of engine, auxiliaries, gas plant, and exhaust boiler (say) £7250	725 0 0		
8 per cent. on buildings and foundations (say) £1600	128 0 0		
		894 5 0	
		£1933 2 0	

Credit.

Tar burnt, 75 tons, at 12s. 3d. per ton	£45 18 9		
*Sulphate recovered: 32¼ tons, at £13 10s. per ton	438 15 0		
Oil recovered by filtration	17 4 7		
	£501 18 4		
* "*Adjustment*" *of above figures*—			
**Less* £1 per ton for sulphate—*i.e.*, showing selling price as £12 10s. per ton	32 5 0		
		469 13 4	
		£1463 8 8	

Take B.H.P. as 670—

B.H.P. hours = 55 × 50 × 670 = 1,842,500.

Cost per B.H.P. hour = 0·19d.

At 90 per cent. generator efficiency, this power equals 1,237,054 k.w. hours. Taking the cost of generator as £720, 10 per cent. on same increases the net running cost to £1535 8s. 8d.

∴ Cost per unit at terminals = 0·298d.

DISCUSSION.

Mr. W. Bleakley (Manchester) quoted the following figures for steam in connection with a mill with which he was formerly connected: It was a 400-H.P. plant. Taking into consideration the cost of the engine-house, engine, &c., in order to wipe-out the original cost in 25 years, and including cost of maintenance, fuel, wages, oil, cleaning, &c., the cost came out at 0·25d. per horse power per hour.

Professor Charnock (Bradford) suggested that the Textile Committee should carry out special tests in regard to the relative values of steam, gas, oil, and electricity for mill-driving.

Mr. Ingham (Bolton) said he would like to see members supplied with the figures relating to gas and oil. He knew a firm of spinners who would be quite willing to submit their running costs for the last twelve months, if other firms would do the same.

After some further remarks,

Mr. Wollaston, replying on the discussion, said every case had to be taken on its merits. It was true they had steam-engines and turbines running at a high pitch of efficiency; but this was equally true of the gas-engine. Dealing with the statements made by Mr. Bleakley in regard to the cost of steam-driving being only 0·25d. on a 400 H.P. installation, he cited the two following sets of figures, worked out for his previous paper on this subject. He said these figures were clearly below Mr. Bleakley's figure for steam.

[Annual Power Estimate for a Gas Power Set, suitable for an average Weaving Shed, comprising 250 normal B.H.P. Engine, capable of taking at least 10 per cent. overload, Coke Suction-Pressure Gas Plant, with all usual and necessary auxiliaries and connections, foundations, and buildings.]

Capital Costs.

Gas plant	£450
Engines and auxiliaries	1700
Exhaust boiler	200
	£2350
Engines and foundations	700

Running Cost Account.

Dr.—385 tons of coke, at 13s.	£250
Oil and stores	35
Mechanic (part time)	75
Labourer	65
10 per cent. interest and depreciation on £2350	235
8 per cent. on 700	56
Maintenance and repairs	25
Total	£741
Cr.—900,000 lbs. of steam raised for mill heating by exhaust boiler = (say) 60 tons of coal, at 11s.	33
Net running cost	£708

687,500 B.H.P. hours for £708 = 0·248d. per B.H.P.

[Annual Power Estimate for a Gas Power set suitable for an average Spinning Mill, comprising 600 normal B.H.P. Gas-Engine, capable of taking at least 10 per cent. overload, Mond Water-Cooled Gas Plant, with all usual and necessary auxiliaries, foundations, and buildings.]

Capital Costs.

Gas plant	£1200
Engine and auxiliaries	3700
Exhaust boiler	310
	£5210
Engine-house and foundations	1100

Running Costs.

Dr.—920 tons of coal, at 11s.	£506
Oil and stores	80
One mechanic	100
Two labourers	130
10 per cent. interest and depreciation on £5210	521
8 per cent. on £1100	88
Total	£1477
Cr.—2,000,000 lbs. steam = 300,000 lbs. of coal, raised by exhaust gases, available for mill heating, say	75
Total	£1402

1,650,000 B.H.P. hours for £1402 = 0·2d. per B.H.P. hour.

SMOKE ABATEMENT IN TEXTILE FACTORIES.

The Spring Congress and Annual Meeting of the Textile Institute was held in the Midland Hotel, Manchester, on Friday afternoon, the 2nd inst., when a paper dealing with the question of "Smoke Abatement in Textile Factories" was read by Mr. Chas. W. Fulton, of Paisley.

In opening, the author made it clear that he came before the members, not as an expert on the subject of smoke, but merely as one who had had to consider the problem as a user, and from a purely commercial standpoint. The question naturally divided itself into two main headings: (1) How are presently installed steam-raising installations to be made smokeless with an increase of profit? (2) What is the best system of smokeless steam-raising to adopt for new establishments? The points to consider under these two headings were quite different, because in the first case the capital was already sunk in plant, whereas in the second the capital was there to be spent in whatever direction seemed best from a commercial standpoint. He then proceeded to set out in detail the lines on which it seemed to him that already-installed boiler systems might be made smokeless with a commercial gain. Referring to his second heading, the author made the following remarks.

The system of first producing gas from the coal, then firing the boilers with the gas, which does away with the smoke nuisance, has advantages; but it would appear that, generally speaking, up till now the capital expenditure has been so high that this method does not come into the realm of practical politics for most commercial concerns. However, there are two new factors which will no doubt have an influence in bringing this system more prominently to the front for new concerns.

First, important developments are taking place in connection with the distillation of coal, more particularly from the point of view of the recently enhanced value of the bye-products that can be obtained therefrom—namely, sulphate of ammonia and the lighter oils. It is rapidly becoming more generally recognized that coal contains extremely valuable bye-products; and I think there is no doubt that there will be great advance made in methods of distillation increasing the percentage of the more valuable bye-products, such as benzol, for which there is a rapidly growing demand for internal-combustion engines, &c. The indications are that there is a big field for development in this direction, which will have an influence on this method of first making gas and then firing the boilers with the gas. Second, there is the new system of firing boilers with gas recently discovered and known as the "Bonecourt System," for producing radiant heat by means of flameless incandescent surface combustion. This recent discovery enables gas to be burnt with the highest possible economy, and further leads to a radical reduction in the size of steam-boilers, housing space, &c., with a consequent saving in capital expenditure.

The distinguishing and essential feature of this new process is that a homogeneous explosive mixture of gas and air, in the proper proportions for complete combustion (or with air in slight excess thereof), is caused to burn without flame in contact with a granular incandescent solid, whereby a far larger proportion of the potential energy of the gas is converted into radiant heat. The advantages claimed for this new system are: (1) The combustion is greatly accelerated by the incandescent surface, and may be concentrated just where the heat is required; (2) the combustion is perfect, with a minimum excess of air; (3) the attainment of very high temperatures is possible without the aid of any elaborate "regenerative" devices; and (4) owing to the large amount of radiant energy developed, transmission of heat from the seat of combustion to the object to be heated is very rapid. [The author then illustrated and described the two principal

forms of the surface combustion element—the diaphragm and the cavity-cobble or granular bed.]

The chief advantages of the Bonecourt system of combustion are: First, high burning or gas efficiency, as complete burning of the combustible is secured with only 1 or 2 per cent. of excess air. Second, high boiler efficiency, since the result of this rapid heat transference is greatly to reduce the dimensions of a boiler of given capacity. This is shown also by the rapid evaporation per square foot of heating surface. With 3-feet tubes, the figure is 20 lbs. of steam per square foot per hour, and with 4-feet tubes 14 lbs., under normal working conditions.

A table of different boilers, with their evaporation per square foot of floor area, is given. The figures are taken from dimensions and evaporation capacities given in "Steam-Boilers and Boiler Accessories," by Mr. W. Inchley, B.S., A.M.I.Mech.E.

—	Floor Area.	Head Room.	Evaporation.	Evaporation per sq. ft. of Floor Space.
	Sq. Ft.	Ft. In.	Lbs.	
Bonecourt	19·5	8 0	2,500	128·0
,,	40	12 0	5,500	137·0
,,	68	14 0	11,000	161·0
A	212	18 9	8,000	37·7
,,	292	18 2	12,000	41·2
,,	318	19 3	16,000	50·0
,,	440	23 10	30,000	68·2
B	209	18 0	8,130	39·0
,,	233	21 0	12,000	51·5
,,	323	21 0	19,200	59·5
,,	552	24 0	39,500	71·6
Lancashire	468	11 6	7,800	16·7
Cornish	298	9 6	2,600	8·7

Note.—A and B are standard types of water-tube boilers.

It will be seen that the Bonecourt boiler occupies about a quarter of the floor space, in comparison with land-type water-tube boilers of about 10,000 or 12,000 lbs. evaporation, and, of course, much less compared with boilers of larger capacity. Over 90 per cent. efficiency can be got by this system.

For these two reasons—namely, first, the advance in the methods of distillation of coal, and, second, the advance in methods of burning gas—I think we may look forward to an increasing growth in the system of firing boilers with gas; and with this method, of course, smoke is eliminated.

The York Appointment.

Out of the 69 applicants for the position of Engineer and Manager of the York Gas Company who responded to the invitation which recently appeared in our advertisement columns, the Directors have selected Mr. Harold E. Bloor, the Gas Engineer and Manager to the Corporation of Carlisle. Mr. Bloor is thirty-one years of age, and in 1898 was articled to Mr. T. O. Paterson, of Birkenhead, for five years. In 1902, he graduated B.Sc. at Victoria University, Manchester; and two years later he obtained the degree of B.Eng. at the University of Liverpool. On the completion of his articles, he was appointed Chemist and Draughtsman at Birkenhead; and in 1907 he became Mr. Paterson's Chief Assistant. While holding this position, he had the exceptional experience of working-out a large scheme of extensions estimated to cost £119,000 when completed. In August, 1909, he was appointed Gas Engineer and Manager to the Corporation of Carlisle; his duties embracing the entire control of the undertaking, including the technical, commercial, and secretarial work. Under his supervision, plans are being prepared for new works, comprising modern carbonizing plant equal to 150 tons of coal per day, and an enlarged carburetted water-gas plant. A year after taking up his duties at Carlisle, he entered upon a comprehensive scheme of advertising and canvassing, which was so successful that it has been continued. He also established a large and popular maintenance department, which has done much to stimulate the use of gas in the city. The training Mr. Bloor has received, and the excellent results he has produced in the few years of his professional career, seem to qualify him specially for filling satisfactorily the position he has obtained; and we cordially wish him success.

Institution of Civil Engineers.—At the annual general meeting of the Institution, the ballot for the election of officers for the ensuing year was declared. The new President is Mr. Anthony George Lyster, M.Eng.; and among the members of the Council are Mr. W. B. Bryan, Mr. Walter Hunter, Mr. Henry E. Jones, Dr. Dugald Clerk, F.R.S., and Dr. Edward Hopkinson.

Southern District Association of Gas Engineers and Managers.—On the invitation of the Chairman and Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company, the members will on Thursday, the 22nd inst., visit the Wandsworth Gas-Works, of which Mr. H. O. Carr, the President of the Association, is Engineer. The Directors have also invited the members to partake of luncheon when at the works. Afterwards, a steam launch will convey them down the Thames to view the Port of London and the reaches beyond. Given fine weather, the Secretary of the Association (Mr. W. E. Price) remarks, the programme is certainly an inviting one.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

National Insurance Act, Part II.—Unemployment.

SIR,—The various decisions of the Umpire on the question of whether contributions are, or are not, payable by certain employees of gas companies having been somewhat conflicting, the Special Sub-Committee appointed by this Association to deal with the matter have submitted some further questions to the Umpire; and I am directed by the Sub-Committee to enclose copies of recent decisions given by the Umpire upon the questions.

I am also requested to point out that these decisions will make a considerable addition to the number of men employed by gas companies who are required to be insured against unemployment, and, further, that, under Decision No. 1315, all work on all gas-pipes in buildings (except services from mains to the meters) is now held by the Umpire to be insurable work.

FRED. E. COOPER, Secretary.

Gas Companies' Protection Association, Victoria Street, S.W., May 9, 1913.

[ENCLOSURE.]

Decisions by the Umpire, dated May 3, 1913.

Decision No. 1315.

On the facts before me, my decision is that contributions under Part II. of the National Insurance Act, 1911 (Unemployment Insurance), ARE payable in respect of workmen engaged wholly or mainly in:—

(1) Fixing or repairing or altering gas-piping in buildings.
(2) Installing for the first time gas-fittings.

This decision supersedes any previous decision in so far as it may conflict therewith.

(Signed) W. B. YATES.

Decision No. 1316.

On the facts before me, my decision is that contributions under Part II. of the National Insurance Act, 1911 (Unemployment Insurance), ARE NOT payable in respect of workmen engaged wholly or mainly in:—

(1) Disconnecting or re-connecting gas-cookers, gas heating appliances and gas-fittings (not including work on piping covered by Decision No. 1315).
(2) Repairing removable fittings.

(Signed) W. B. YATES.

Street Lighting Specification.

SIR,—As I had already spoken in the discussion on Mr. Trotter's paper when Mr. Goodenough alluded to some opinions expressed by me six years ago, and consequently had no opportunity of replying, may I now crave the hospitality of your columns to do so?

Mr. Goodenough appears to think that because I am now in favour of the proposed draft specification, I have changed the views I held in 1907. Nothing could be further from being the case. I was then, and still am, absolutely convinced that the horizontal illumination is the only satisfactory criterion of street lighting.

In the article quoted by Mr. Goodenough, I said:

> "There can be no doubt that this is the right quantity to measure, if for no other reason than because the end in view is to illuminate a given area. The candle-power of the lamps used is merely a means to that end."

Mr. Goodenough entirely cuts the ground from under my feet by his appreciative references to my remarks in the article in question, which he describes as "very practical and sound." I fear, however, he will hardly apply these epithets to the paragraph which I have just quoted. The point which he seems anxious to make is that in 1907 I held that it was the average horizontal illumination which counted, whereas in 1913, I am found to be in agreement with a specification which takes the minimum horizontal illumination as the criterion. I can assure Mr. Goodenough that I am still strongly of opinion that the average illumination is of importance. In fact, I said so a few weeks ago in the discussion on Messrs. Pearce and Radcliff's paper on the "Street Lighting of Manchester."

At the same time, I am not in favour of making a statement of either the maximum or average obligatory in a street lighting specification, and this for the following reasons:—

1. The measurement of the average illumination over a given area is a matter involving a large amount of work—certainly much more than could possibly be devoted to it by the engineer in supervising the execution of a lighting contract.
2. To specify the maximum illumination is open to the very serious objection that "freak" spots would have to be guarded against.
3. Most important of all, experience has shown—as is made abundantly clear by Mr. Trotter in his paper—that the minimum illumination does, under present conditions of lighting, give a criterion which is in entire accord with that made by eye by experienced judges.

With regard to Mr. Goodenough's query as to my opinion of a "dismally lighted street" as compared with a "brightly lighted one," I would reply that it is entirely a question of the amount of money which the purchaser is prepared to spend—seeing that clauses 7 and 8 of the proposed specification give the engineer complete control in this respect.

I should like, finally, to bring clauses 9 and 11, as well as those just cited, to the notice of Mr. Goodenough and the other speakers who seem to have derived so much exhilaration from the mental gymnastics involved in working out all the possible and impossible combinations of height, spacing, and candle-power giving the same horizontal illumination. If the infinite number of such combinations (all giving the

same result) means anything at all, surely it is that it is better to specify the result rather than the ingredients which go to make it up. And this, more especially seeing that the capabilities of one of the chief ingredients—namely, the lamp—cannot possibly be so well known to the purchaser as to the supplier.

Mr. Goodenough's gastronomic example makes me think that I have somewhere heard an old saying connecting the number of cooks with the quality of the broth. Why not specify the broth, and leave the dimensions of the saucepan and the specific gravity of the ingredients to the cook?

Hendon, N.W., May 5, 1913. KENELM EDGCUMBE.

[This letter unfortunately arrived just after last week's issue of the "JOURNAL" was published.—ED. J. G. L.]

Mr. Edgcumbe's letter was sent (in proof) to Mr. Goodenough; and the following is his reply.

SIR,—Thank you for the opportunity of replying to Mr. Kenelm Edgcumbe's letter. It certainly conduces to your readers' convenience if the two sides of a question can be presented simultaneously.

I am glad to learn that Mr. Edgcumbe is still strongly of opinion that the average illumination in a street is of importance. This means that we have only got to arrive at some practical means for relating our specification to that average for us to get nearer the goal of agreement upon a standard specification.

But before we can get any further on the road to that desirable end, it is necessary to remove from the minds of Mr. Edgcumbe, and those who think with him, the idea that minimum horizontal illumination is the only factor necessary to specify in an illumination contract.

I have already endeavoured—in the reply to Mr. Trotter, which you published last week—to make clear the fallacy underlying the contention that, because the classification of streets made by the surveyors approximated nearly to that made on the basis of minimum horizontal illumination measurements taken in those streets, therefore minimum horizontal illumination was the only factor necessary to specify in order to ensure an exact reproduction of the illumination of those streets as a whole. I would ask Mr. Edgcumbe kindly to refer to that reply.

May I, however, just add one illustration of my point, taken from an analogy I have already used. If Mr. Edgcumbe had found three *table d'hôte* dinners of almost equal merit in satisfying his taste and appetite, each of which comprised in the menu "herrings on toast" as the "minimum" course, would he think it sufficient in entering into a contract for a dinner to specify the quantity of herrings on toast, leaving all other details to the contractor?

We must get it clearly into our minds that minimum horizontal illumination is only one of the effects produced "under present conditions of lighting," which were not built upon a specification with minimum horizontal illumination as its basis.

Once we have all got to the point of agreeing that a standard specification of street lighting must have regard to the *general result* produced, and not to one factor alone of the several which form the whole, there will not be any serious difficulty in arriving at a practical form of specification.

Mr. Edgcumbe contends that the measurement of the average illumination over a given area would involve a large amount of work. That is perfectly true, if the term is interpreted in a literal, instead of a practical, sense. But what I am concerned with is a specification which will *have regard to* maximum and average illumination—not one which shall necessarily require these factors to be determined absolutely.

For example, I should consider that a specification had sufficient regard to the maximum and average illumination of a street if it laid down, within reasonable limits, what relation should exist between the candle-power measurements of lamps (of given height at defined distances apart) at three specified angles below the horizontal—say at 10°, 20°, and 50°, taken in the line of maximum illumination—with a clause providing that measurements taken at similar angles in any other direction should not be less than a specified percentage of those taken in the direction of maximum illumination.

Such a specification would not entail a heavy amount of work upon the engineer having supervision of the contract; it would sufficiently guard against "freak" spots of lighting; and it would overcome many of the objections raised against the draft specification.

I do not understand Mr. Edgcumbe's definition of the work of extracting from the table kindly provided by Mr. Haydn Harrison a few of the varying combinations of height, spacing, and candle power, which would give the same minimum horizontal illumination, as "mental gymnastics." It appears to me to be a very simple, easy, and natural exercise. The fact that it leads to a reduction to absurdity of the specification is not to be disguised by making light of the process.

Mr. Edgcumbe refers me to clauses 7, 8, 9, and 11—apparently imagining that they meet some of my objections to the specification. I have only to repeat, and to emphasize, my strong objection to any specification for street lighting which leaves it open to *tenderers* to specify the height of lamps, subject only to a declared minimum, and consequently to determine the power of the lamps to be used to produce the minimum horizontal illumination.

The object of a standard specification is defeated if the relative merits of two or more schemes for lighting which will produce the same minimum horizontal illumination, but may differ radically in other respects, are left open for discussion by a local authority having little or no capacity for forming a judgment as between the rival schemes.

Horseferry Road, May 8, 1913. F. W. GOODENOUGH.

Gases Generated by the Fusing of Bitumen Covered Electric Cables.

SIR,—The illustrations on p. 388 of the "JOURNAL" for May 6, of the electric cables which are now admitted to have been the source of the trouble in the Hebburn district, remind me of my investigations immediately following the serious explosion at the George Hotel, Nottingham. In that case I reported that the explosion was brought about by the carbonization of the non-conducting bituminous material protecting an electric cable running near the property; and I afterwards confirmed this by reproducing in the laboratory the conditions which appear to have prevailed preceding the disaster. The analysis showed that the bitumen yielded a gas in quantity and quality equal to a first-class cannel coal.

W. R. HERRING.

Palace Chambers, Westminster, May 8, 1913.

TEST OF BITUMEN.

Distillation.

7·5 grms. mixed with ground brick and distilled in glass tube in combustion furnace, the gases passing over about 3 inches of red-hot brick dust.

7·5 grms. gave 144 cubic inches of gas = Yield per ton of 11,300 cubic feet. Specific gravity of bitumen, 1·36.

Gas Analysis.

	Per Cent.	
Carbon dioxide	4·55	7·61
Sulphuretted hydrogen	3·06	
Heavy hydrocarbons	12·64	
Oxygen	·64	
Carbon monoxide	7·18	
Methane	36·24	
Hydrogen	27·18	
Nitrogen	8·51	
	100·00	

Hygienic and Heating Efficiency of Gas-Fires.

SIR,—We have carefully read the article written by Mr. H. James Yates which appears in your issue of May 6, and also your editorial comments concerning it.

We would like to take this opportunity of thanking you for the very clear and fair way in which you commented upon the statements in Mr. Yates's article. The leader puts the case so admirably that it is quite unnecessary for us, at this point, to refer at any length to the total absence in Mr. Yates's article of material facts and figures. When he has replied to the various pertinent queries which you have put to him, we shall then be, from the fuller knowledge of his position, better able than at present (as his inconclusive article stands) to frame a complete and suitable answer. While Mr. Yates is replying (we hope he will do so without delay) to the request contained in your editorial, for full and reliable information in support of his assertions, it would be of great interest if he would mention the names and sizes of the two fires which were subjected to the test to which he refers in the article.

We are sure that Mr. Yates will not refuse the information asked for, seeing that (as we gather from his article) he is so solicitous for scientific truth and the general welfare of the gas industry.

May 8, 1913. THE DAVIS GAS STOVE COMPANY, LTD.

Edinburgh Public Lighting.

SIR,—For the sake of historical record, will you allow me to give a few notes upon the introduction of the inverted incandescent burner into the Edinburgh street-lamps and the incandescent lighting of the common stairs.

The inverted incandescent burner was first applied to outside lighting purposes by the Gas Commissioners in 1904. In a letter to the Chairman of the Lighting Committee (who was also a member the of Gas Commission), of Nov. 25, 1905, I stated:

> With regard to the inverted burners, we have now had some few lanterns fitted with the 2½-feet per hour inverted burners in use for more than twelve months; and while the lighting efficiency per foot of gas is not so great, I must say I would like to see a street lighted with them, so that it could be contrasted with another street lighted with the present 3-feet upright burners. One great advantage of the inverted burner is that it throws the light down so much more effectively than any other type.

About the end of 1905, the Inspector of the Lighting Department was carrying out experiments with inverted incandescent burners, with the assistance of the Gas Commissioners; and on Dec. 15, in replying to a letter from Mr. Mackay, wherein he raised some questions as to pressures, he was told by me that we had had similar burners in use in outside lamps for considerably more than one year, and that they had given every satisfaction.

We adopted originally the "Star" inverted burner, as we found, from an exhaustive series of tests, that it gave the best results, owing to the fact that the combustion chamber was supplied with unvitiated air from the exterior of the glass globe, and preheated in its passage through tubes leading to the bunsen chamber.

The fitting-up of the street-lamps in Edinburgh with inverted incandescent burners was systematically taken in hand early in 1906. Experiments were carried on more particularly with regard to the minimum consumption that would give effective illumination. But in a letter under date of July 3, addressed by me to the Inspector of Lighting, I called his attention to the fact that I saw by the Public Press the Corporation had decided to fix the consumption in the public lamps at 2¼ feet per hour, and that I had already made preparations for the adoption of a standard nipple that would, on the average, give this consumption during the hours that the lamps were lighted. On Aug. 2, correspondence passed, dealing with the great difficulty of getting the standard nipples supplied by the makers, and recording the fact that out of hundreds of burners, each of which was tested, there were scarcely two alike as regards consumption under like conditions. Rather than delay the introduction of the new system of lighting, it was arranged that the burners should be put on, right or wrong as regards

consumption, and a record kept of where the nipples were unsatisfactory, and the standard nipple applied later in the season.

As regards the stair lighting, the burner adopted was of a special type primarily designed by Mr. Somers, the Gas Commissioners' Superintendent of the Fittings Department.

It is quite true that a few of the Wilson burners were originally introduced on trial in Edinburgh; and though eminently satisfactory in every way, and suitable for the Glasgow conditions, they were not found to be suitable for the different conditions prevailing in Edinburgh stairs. A special type of burner was, therefore, devised, consisting primarily of a cast-iron case with a long funnel, and special air-inlet provision for both the bunsen chamber and for combustion. This was ultimately produced; the different parts being obtained from various makers in England, and the burners fitted together in Edinburgh and supplied to the number of some 14,000 or 15,000 by the Commissioners, and maintained by them under contract with the Corporation.

W. R. HERRING.

Palace Chambers, Bridge Street, S.W., May 8, 1913.

REGISTER OF PATENTS.

Converting Coal Tar, Creosote, &c., into Pitch.

LA SOCIÉTÉ ANONYME DES COMBUSTIBLES INDUSTRIELS, of Paris.

No. 8712; April 12, 1912. Convention date, July 8, 1911.

In setting out to describe their invention, the patentees say: It is impossible to completely convert ordinary coal tar or naphthalene and anthracene oils or residues, creosote and schist oils, and petroleum residues into pitch by merely treating these hydrocarbons with a current of air at a raised temperature, as the chemical reaction necessary for the withdrawal of hydrogen is insufficient, and as the products thus treated are partly distilled. The conversion into pitch of coal tar or oils is greatly improved (and rendered practically complete), however, if the products to be treated are heated and submitted to the action of a current of air in a series of interconnected columns; so as to increase the static pressure under which the air current is supplied to the tar or oils to be treated.

In the case of oils or petroleum residues and the like it is said to be of advantage, moreover, first to mix these oils with coal tar that has a higher boiling point than the oils to be treated. The dissolving action of the tar will prevent distillation, and it will be possible to increase the temperature at which the mixture is treated, and thus render the chemical action of the air more thorough.

The action of a current of air above 100° C. on creosote and schist oils is twofold and produces, firstly, a mechanical effect which increases as the velocity of the air current is increased and facilitates distillation, and, secondly, a chemical effect which results in a partial oxydation or a withdrawal of hydrogen, and which increases as the temperature and pressure or the duration of the reaction are increased.

These three factors—temperature, pressure, and time of duration—are, it is pointed out, all important in producing the desired result and may be increased to such an extent that all the oxygen of the air is used up and the chemical reaction attains its maximum effect, whereas the mechanical action of the current of air is reduced to a minimum. The temperature cannot be substantially increased, as a higher temperature than is usual will not only improve the chemical reaction but will at the same time facilitate distillation; and the latter is to be avoided.

The present invention relates to a process in which the whole chemical effect of the current of air on the hydrocarbons referred to is made use of by the combined action of heat, pressure, and the duration of contact between the air and the hydrocarbons to be treated; the operation being carried out without distillation, and the hydrocarbons referred to, when other than tar, being mixed with a suitable solvent (such as tar), that may counteract distillation.

The mixture to be treated is heated to a temperature of 110° C., and submitted to the action of a current of air which is fed to the mixture under pressure and in a divided condition. The pressure of the air current must be equal to the final pressure of the gas escaping from the apparatus after treatment and the column of liquid through which the current is passed. The pressure of the air is increased by treating several columns of liquid simultaneously, and thus increasing the static pressure of the liquid. The action of the air is at its maximum in the first column, as it parts in this column with practically all its oxygen. The temperature of the tar oils treated in this column is soon increased by the exothermic reaction thus produced; whereas the chemical reaction would begin to slacken if the temperature remained constant. A desulphurization of the substances treated is also effected in the first column.

The air current is afterwards passed from the first column to the following columns. The vapours carried away by the hot air as it leaves the first column are absorbed in the following columns, and the temperature of the latter is raised to some extent by the hot current of air. If necessary, hydrogen may also be withdrawn in this latter series of columns by the prolonged action of this current of air.

The temperature of the subsequent columns cannot be increased like that of the first column, as the air passed into these columns is deprived of oxygen, and is therefore not capable of producing a chemical reaction. The air current supplied to the subsequent series of columns merely carries forward the calories it possesses. The vapours carried away by the air current as it emerges from the first column are entirely dissolved in the following columns; and the latter form a mixture that will afterwards likewise be submitted to the direct action of a current of air. When the reaction is sufficiently advanced in the first column, the column is cut off, the pitch which it contains is poured out, and a new charge of tar oils is supplied to the column. After being recharged, the column is arranged to constitute the second or third unit in the series of columns, and its resistance to the current of air increases the pressure. At the same time the hydrocarbon vapours carried off from the first column are dissolved therein.

The addition of dissolving tar to the hydrocarbons treated with a divided air current according to this invention will allow of a temperature of 250° C. being attained in the case of coal tar, and 320° C. in the case of petroleum residues, without incurring any appreciable distillation.

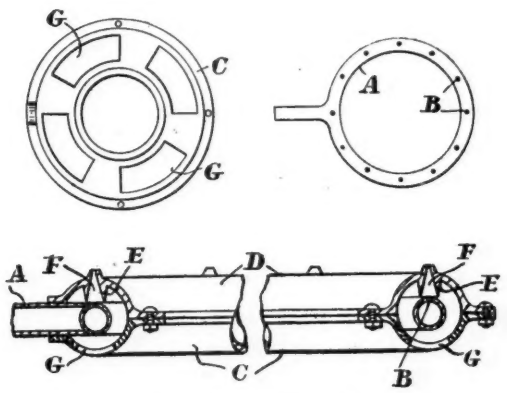
When practically applying the process, the apparatus employed comprises several columns into which the tar oils or mixtures to be treated are charged; the columns being subsequently heated to a temperature of 110° C. A current of air is passed in a divided condition into the lower part of the columns, and is caused to rise through the whole mass at the final pressure of the gases escaping from the apparatus and the columns of tar oils to be treated. In order to increase this pressure, any number of columns may be arranged in connection with each other and all submitted to the action of the same current of air. If convenient, resistance or pressure valves may be placed at the outlet for the gases. The columns are connected together by piping, so that the air current which escapes from one of the columns may be passed into the lower portion of the next column or of all the following columns. It is thus possible to cut off any column of hydrocarbons that has been sufficiently treated and pass the direct current of fresh air into the next column—suitable valves and cocks being provided for this purpose. The necessary pressure for passing the air through the liquid mass is obtained by an air compressor of sufficient strength to overcome the pressure produced by the height of the oil columns, or by a suction device provided with a condenser under reduced pressure.

Bunsen Burner Tubes, Gas-Rings, &c.

STEPHENS, C., of Manor Park, Essex.

No. 12,832; May 31, 1912.

The patentee claims, in a gas-burner with multiple jets from a perforated gas-tube within a holder or stand fitted with a perforated cover, the formation of nipples each having an air passage and forming an independent mixing chamber above and reaching internally down, with a comparatively large base, to the corresponding perforation in the gas tube.



Stephens' Bunsen Burner Tubes.

A domestic gas-burner thus arranged is shown in the illustration—a plan of a lower supporting channel for a gas-ring, a plan of the corresponding perforated gas tube, and a transverse section (to a larger scale), of a partly broken-away gas-ring and perforated cover showing one form of the burner.

The gas tube or ring A is in direct connection with the gas supply, without the intervention of an air-mixing chamber, and the pure gas issues through the perforations B. The bunsen effect is obtained by placing the gas tube in a holder or stand C fitted with a perforated cover D. Although ordinary perforations in the cover may be made above each gas jet issuing from the perforations of the tube, a better effect is said to be obtained by forming nipples E with a tapering passage F, at the interior of the cover. The flow of gas into the passage "causes the ambient air to ascend and mix with it, and then burn above the nipple without any tendency to fire-back." When the lower part of the stand is in the form of a channel, the latter must have ample air-inlet openings—such as G.

Gas-Fires.

PARKINSON STOVE COMPANY, LIMITED, and MAWBEY, P. C., of Birmingham.

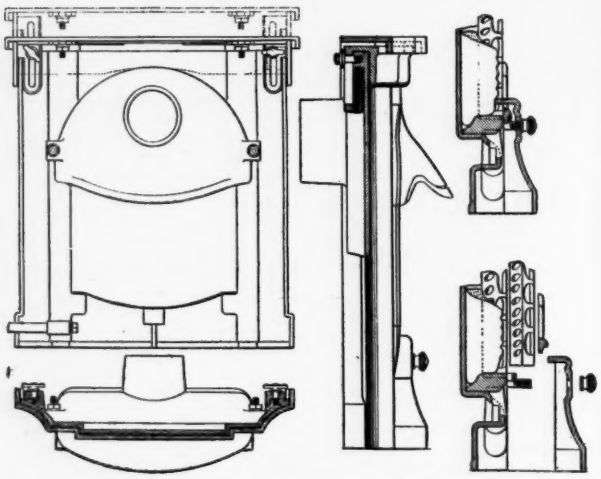
No. 15,549; July 3, 1912.

This invention has for its object to provide means for rendering gas-fires adjustable in height.

The fire (as shown) has a cornice or top part which may be raised or lowered to increase or decrease the height of the fire according to the size of the grate in which it is fixed. To give the fuel or radiants an "improved appearance," they are arranged upon stepped supports so that their upper ends form a curve, while they are held in position by a transverse guard secured in place by a detachable fender.

It has already been proposed, the patentees state, to employ, in connection with a gas-fire, a separate front plate quite distinct from the gas-fire itself, having an opening in its lower part within which the gas-fire is placed, and arranged to close the opening of a coal or like fire-place or the mantelpiece opening; the upper part of the plate having a vertically adjustable cornice or frieze plate adapted to be fixed in position, so as to meet the different heights of the existing fire-place

opening, by screws or bolts, projecting from the front of the cover plate, and passing through slots in the frieze plate. The present invention, however, relates to a vertically adjustable cornice provided upon the gas-fire itself and adapted to increase or decrease the effective height of the gas-fire. The ends of the cornice are each formed with a depending bracket or lug by which it is adjustably secured to the framing; each bracket or lug being formed with a slot for the reception of a wing-headed bolt adapted to screw into a tapped hole in the framing so as to rigidly secure the cornice in position. In order to alter the height of the gas-fire frame, it is only necessary to unscrew the bolts when the cornice may be raised or lowered to the desired extent.



Mawbey's (Parkinson Stove Company's) Adjustable Gas-Fire.

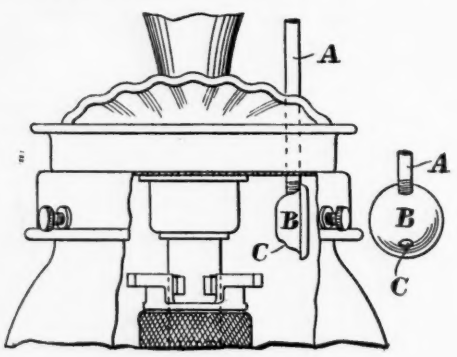
The illustration represents a rear view of the gas-fire, a cross-section through the upper adjustable portion, a vertical section through the fire (partly in elevation), a vertical section of the lower part, and a similar view showing the fender and guard removed to allow of the removal of the fuel.

Bye-Passes for Gas-Burners.

SPREADBURY, R. J., of Tunbridge Wells.

No. 12,919; June 1, 1912.

This invention to render the bye-pass flame more stable consists in providing, at the end of the bye-pass tube, a chamber or enlargement from an orifice in which (so situated that there is gas in the chamber above the orifice) the gas issues and is burnt to form the bye-pass flame. The object being to render the flame stable under variation of surrounding conditions, the patentee points out that it does not suffice to introduce the chamber or enlargement at any other position in the bye-pass tube than at the end, and the chamber must itself carry the orifice or jet at which the flame burns. Hence the introduction of a chamber at a part of the bye-pass tube removed from the end (which has been suggested as a means for preventing extinction of the flame owing to fluctuations of pressure within the tube) will not serve the purpose of the present invention.



Spreadbury's Gas-Burner Bye-Pass.

The bye-pass tube A, connected with the gas supply in the usual manner, terminates in a chamber B provided at its lower part with an orifice C. The pilot jet burns at this orifice; so that the flame has immediately behind it in the chamber a reserve of gas considerably greater than if the gas burnt at the orifice of the tube, rendering the pilot flame less liable to extinction by disturbance of surrounding conditions.

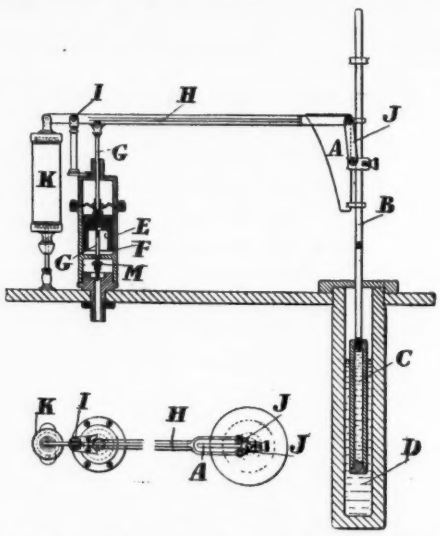
The patentee explains that the burner shown is to be used with a distant control—such as a cock near the door of the room. This, he finds, causes the pilot flame to be suddenly elongated when the main supply of gas is turned on. Hence the position of the chamber C at a comparatively long distance from the burner. The position, however, has nothing to do with the invention; and the statement is merely made lest it be thought that an inoperative burner is shown.

Registering Mechanism of Gas-Meters.

BERRY, J., and GLOVER, W. T., of Oldham, and METERS LIMITED, of Manchester.

No. 15,211; June 29, 1912.

This registering mechanism of gas-meters provides means for compensating for variations in the density of the gas passing through the meter due to variations in the gas pressure. In mechanism of this type it is usual to provide an aneroid or elastic metal chamber, or a spring loaded piston for operating a member which regulates the rate at which the registering mechanism is actuated relatively to the meter upshaft or equivalent element. The present inventors, however, provide means for regulating the registering mechanism in accordance with the gas pressure, which they say is "simple in operation and not liable to take a permanent set, or to stick and get out of order."



Berry and Glover's (Meters Limited) Registering Mechanism for Meters.

The illustration shows a sectional elevation and a plan view of the mechanism, as adapted to control the position of the striking plate A described in patent No. 7727 of 1911. The plate is attached to a rod B supporting a weight C immersed in liquid D. The weight may (as shown) be a receptacle containing mercury and the liquid in which the receptacle is immersed may likewise be mercury. With this arrangement, the actual dead-weight of the immersed receptacle will vary with the degree of immersion. Thus, when the receptacle is at maximum immersion, a minimum weight will be placed upon the rod B corresponding to a minimum or low gas pressure; but when the weight is raised more or less out of the liquid its weight will increase to correspond with the increased gas pressure.

For raising and lowering the weight and the plate according to the gas pressure, a piston E is provided to work within a cylinder F exposed at its lower side to the gas pressure. But, in place of the piston a diaphragm may be used or a combination of piston and diaphragm may be employed. The movement of the piston, diaphragm, or equivalent is transmitted to the weight by the rod G, lever H pivoted at I, links J, and rod B. A balance weight K is attached to the lever.

As stated, the rising and falling weight actuates a striking cam-plate as described in the 1911 patent. But it may be caused to actuate a friction wheel working between two friction discs, or a gear wheel which can mesh with any one of a number of wheels or sets of wheel teeth. Means may be provided—such as the valve M on the piston rod G—for cutting off the supply of gas to the piston E when the pressure in the meter exceeds a predetermined amount; or a stop may be provided for limiting the movement of the piston or its connected parts.

Reversing Apparatus for Regenerative Gas-Furnaces.

KOPPER, H., of Mülheim-Ruhr, Germany.

No. 17,732; July 31, 1912.

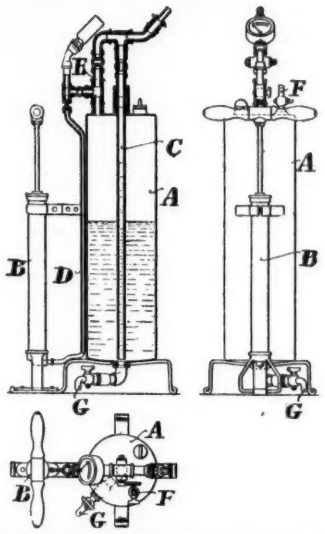
This invention relates to a further modification of the regulating and reversing apparatus described in patents No. 30,294 of 1909 and No. 19,372 of 1911, with the object of introducing "various improvements whereby the construction of the apparatus and its action and management are essentially simplified." The present improvements are directed towards the positioning of the parts of the rocking member relatively to one another, as also to the water inflow and outflow. A further improvement serves for the utilization of the variable water supply for the control not only of the gas-valve but also of the air-supply to the regenerative furnace. This is attained by connecting the water-supply pipes for the chambers of the gas-valve, with the similarly arranged air-valve. The latter has chambers in which different water levels can be provided by operating the rocking member in the manner previously described with reference to the gas-valve. This control is simultaneously effected for both valves; and consequently only a single reversing member is required, where previously two had to be used. The arrangement of one reversing member for both valves (gas and air valve) is said to provide "a simplification in the control-mechanism and greater reliability in the working of the furnace, without loss in the gas and air supply." At the same time it is claimed that considerable economy in labour and expense is ensured.

Indicating and Stopping Leaks in Gas-Pipes.

SESTERHENN, N., KLAUER, J., and KLAUER, A. (Rohr-Verdichtungs G.m.b.H.), of Cologne.

No. 29,499; Dec. 21, 1912.

The patentees, in their specification, point to the well-known fact that leaks in gas-pipes have hitherto been remedied only with very great trouble. "Frequently it has been found that the exposing of the pipe at the damaged points was the only safe method to get at the leak. This exposing is, however, often impossible without very considerable damage to the building. Other methods for the repair of leaks have hardly been known; and it may be concluded that they have not proved successful. According to the present process this trouble is remedied . . . by filling the gas-pipe completely with a special liquid, and allowing this liquid to run off again after a short time at the lowest point. The liquid is composed of a solution of shellac, rosin, or similar materials, in spirit. In other words, a kind of polish, which has been found to have the property of penetrating into all leaking spots of the gas-pipe and of leaving there, after the evaporation of the spirit, a closing layer. This action appears reasonable without further explanation, when it is borne in mind that the materials employed for the solution—such as shellac, rosin, and the like—possess for the purpose in view specially favourable properties. These substances deposit completely in all holes and splits of the pipe firmly and therefore assure a permanent caulking thereof."



A German Proposal for Stopping Leaks in Gas-Pipes.

For carrying out the process special apparatus is suggested, as illustrated. It consists of a closed receptacle A for the liquid and an air-pump B. Through the cover of the receptacle there passes an upright delivery tube C down almost to the bottom. This tube connects at its upper end by a flexible tube with the lowest point of the gas-pipe; and the operator presses the liquid by actuating the air pump into the pipe "which must have at its uppermost end as well as at various intermediate points a little air escape." As soon as the entire pipe system has been pumped full, the liquid is allowed to flow back again after a short time into the receptacle, as can easily be effected as soon as the compressed air is allowed to escape.

Apparatus of this kind can also be used for testing pipes for leaks, if, instead of liquid, air only is pumped into the system.

In order that the apparatus may be used without emptying out the liquid whenever required for testing the gas pipe, a connection is provided between the air pipe D and a tube E outside, which can be shut off by means of a cock, to be opened when the gas pipe is tested, but closed when the liquid is to be forced in. The escape of air is provided for by placing a cock F on the cover of the receptacle; and for letting off the liquid, there is provided at the bottom a cock G.

Mr. Goulden's Views on Profit-Sharing.

The first paragraph under the "Notes" heading in the April number of "Profit-Sharing and Co-Partnership" deals with the remarks made by Mr. T. Goulden, the Chief Engineer of the Gaslight and Coke Company, in his recent address to the London and Southern District Junior Gas Association. The writer said: "The transformation of the mere wage-earner into a proprietor, no matter in how small a degree, was, in Mr. Goulden's opinion, one that must tend to develop the quality of personal interest of the workman in his work; and that it succeeds in its object is patent to all who have given co-partnership a serious trial. To Mr. Goulden, one of its best features is that, managed as such schemes are by committees on which are represented all ranks of an undertaking (directors, officers, and workmen), it makes for closer personal intercourse at frequently recurring intervals of time, when the exchange of views, and the consideration of proposals having in view the promotion of a common interest, make strongly for mutual regard and good fellowship—qualities which in times of stress are likely to be of inestimable value. As the principles of co-partnership are more widely understood, and its practice more extensively adopted, it will prove of the greatest possible value, not only to gas men, but to the nation generally, in reconciling many interests which, while generally considered to be conflicting, are in reality identical. Such a tribute from one who has intimate knowledge of the working of the scheme is certainly encouraging."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress had been made with Bills on the rising of the House last week for the Whitsuntide recess:—

Bill brought from the Commons and read the first time: Mynyddislwyn Urban District Council Bill.

Bills reported: Crowborough District Gas and Electricity Bill, Harrow and Stanmore Gas Bill.

Bills read the third time and passed: Grays and Tilbury Gas Bill, Llantrisant Gas Bill, Porthcawl and District Gas and Electricity Bill, West Hampshire Water Bill.

The Broadstairs and St. Peter's Urban District Council Bill, Huddersfield Corporation Bill, Leicester Corporation Bill, and Metropolitan Water Board Bill have been referred to a Select Committee, consisting of Lord Clinton (Chairman), the Earl of Lovelace, Lord Shute, Lord St. Levan, and Lord Stanmore; to meet on Wednesday, the 4th prox.

HOUSE OF COMMONS.

The following further progress has been made with Bills down to the rising of the House last Thursday for the Whitsuntide recess:—

Bills brought from the Lords and read the first time: Grays and Tilbury Gas Bill, Llantrisant Gas Bill, Porthcawl and District Gas and Electricity Bill, West Hampshire Water Bill.

Bills read a second time and committed: Northampton Corporation Water Bill [Lords], Silloth Gas Bill, Slough Gas Bill [Lords], South Staffordshire Mond Gas Bill [Lords], South Staffordshire Water Bill [Lords].

Bills reported: Derby Corporation Bill, Lymm Urban District Council Bill.

Bill read the third time and passed: Pontypridd and Rhondda Joint Water Board Bill.

The Tottenham Urban District Council have withdrawn their petition against the Tottenham and Edmonton Gas Bill.

The returns relating to the gas undertakings of the United Kingdom—for the year ended Dec. 31, 1912, in the case of the Companies, and March 31, 1913, in that of the Local Authorities—were formally ordered by the House last Tuesday.

On Wednesday, Mr. James Hope asked the Prime Minister whether he could see his way to afford facilities for the second reading of the Companies (Co-partnership) Bill, with a view to its reference to a Select Committee. Mr. Asquith, in reply, said he was afraid he could not undertake to give facilities to the Bill. The measure stands for second reading on the 3rd prox.

LYMM URBAN DISTRICT COUNCIL BILL.

This Bill was last Tuesday and Wednesday before Section A of the Local Legislation Committee of the House of Commons, presided over by Mr. MIDDLEBROOK.

Mr. J. W. JEEVES, Counsel for the promoters, the Urban District Council of Lymm, after pointing out that Lymm was a district to the north-east of Cheshire on the borders of Lancashire, said that the Bill proposed the acquisition of the local Water Company and an extension of the water supply limits, together with a reconstruction of the gas-works, and a similar extension of limits. With regard to the water undertaking, an Act was obtained in 1874 constituting the Lymm Water Company, and from that day onwards the water supply of Lymm had been in the hands of the Company. The Council had tried since 1899 to purchase the undertaking; but the price asked was so excessive that no arrangement could be made. Terms were subsequently fixed, however, for the purchase of the undertaking by the Council. One of the conditions with regard to the purchase was that there were certain lands which the Council must also purchase. These lands comprised a lake, known as Lymm Lake, and certain adjoining lands, which the Council proposed to use for recreation ground purposes. The area covered by the lake was 16 acres, and the adjoining land was also 16 acres—32 acres in all. The water in the lake was at present used for driving a turbine in connection with the water undertaking. The price agreed upon, including the lands, was £20,050; and the income it was anticipated that the Company would derive from the undertaking was between £700 and £800 a year. Against this, interest and sinking fund would have to be paid. The water-works at the present time were quite capable of supplying a very much enlarged population; and the Council looked forward to the time when this purchase would really be a source of profit to the community and not in any sense a source of burden. The Council had reason to believe that there would be considerable development. A gentleman had bought 100 acres of land in the low-lying part of the district for the purpose of constructing salt-works. The Council also asked for an extension of the water supply limits to the parish of Warburton, which adjoins the parish of Lymm. The parish of Warburton was at present within the limits of supply of the North Cheshire Water Company, who had agreed to the proposal of the promoters to supply this area, owing to their own mains being two miles away. Reference was then made to a report of the Local Government Board, in which it was anticipated that the cost of acquiring the water undertaking would be a serious burden on the Council; and the Board had expressed doubt as to whether the Council were justified in incurring the cost of a Bill. As a matter of fact, the promoters themselves were more impressed with the seriousness of this cost than the Local Government Board, and had considered the matter most anxiously before proceeding with the Bill. But they had come to the conclusion that it was absolutely essential in the interests of the district that the cost should be incurred. If they had not come to Parliament, the Council could not have had their limits of supply

extended to the parish of Warburton. They also had to come to Parliament for the dissolution of the Company.

Mr. E. H. RHODES, of the Local Government Board, expressed the opinion that the Company could be purchased under the Public Health Act without coming to Parliament.

Mr. JEEVES agreed, but said the Company could not be dissolved without parliamentary power, and, further, if the Council had purchased under the Public Health Act, they would have had to pay the expenses of the Company in promoting a Bill for its dissolution.

The CHAIRMAN asked what authority a statutory company would have to distribute their capital without coming to Parliament.

Mr. JEEVES said he thought none. Continuing, he referred to the case of the Morecambe Tramway Company, where part of the undertaking was purchased by the Morecambe Corporation, and when they wanted to distribute the capital they had to come to Parliament for the purpose. With regard to the present Bill, he mentioned that the promoters would also have had to obtain a Provisional Order to carry on the undertaking. The Council had come to the conclusion that it was to the interest of the district that they should include the purchase and promote the Bill.

Mr. *G. L. Welford*, the Chairman of the Parliamentary and Finance Committees of the Lymm Council, was called in support of the proposals in the Bill.

Mr. RHODES asked whether it was expected to make both ends meet with respect to the water undertaking right from the first, and witness replied in the affirmative.

The CHAIRMAN asked whether the Council had the means for securing a supply of water equal to the increased demand likely to ensue.

Witness replied that he had been told so.

Mr. JEEVES mentioned that Mr. Alfred Watkin, the High Sheriff for Cheshire, and a resident of Lymm, had been very desirous of coming before the Committee and speaking in favour of the proposal to buy the water undertaking. Unfortunately, however, he was ill, and could not give evidence; but he wished to impress this fact upon the Committee.

The CHAIRMAN remarked that Mr. Welford's evidence had impressed the Committee strongly that the view of the district was that the water-works should be purchased.

Mr. *William Beckett*, the Consulting Engineer to the Council in respect of the water undertaking, said that the plant consisted of two pumping-stations, a covered service reservoir with a capacity of 200,000 gallons, a water-tower with a tank of 55,000 gallons capacity, in addition to the service mains throughout the district. Approximately half the district was supplied from the tower and half from the reservoir. During his examination of the works with a view to estimating the value, he had found that most of the mains, which had been in for thirty years, were practically in as good a condition as when originally installed. The buildings also were in a thoroughly up-to-date condition, while a certain amount of the pumping plant was comparatively new—only having been put down in 1906. The pumping plant was in duplicate; and one set was sufficient for the present needs of the district. The supply was obtained from borings 300 feet deep, and there was a very ample supply available. His estimate of the structural value of the plant, exclusive of land, was £16,754, which was £500 in excess of the price which had been apportioned by the Council to this part of the purchase. He anticipated that during the next twenty years the population would double itself, and that for an expenditure of £9918 this population could be supplied on the basis of 25 gallons per head per day. The new works would consist of doubling the size of the service reservoir and increasing the capacity of the water-tower, together, of course, with additional pumping plant. The existing pipes could deal with from 20 to 25 per cent. more than the supply; and it would be four or five years before any extensions in this direction would be necessary, except the mains to Warburton.

Mr. JEEVES addressed the Committee on this part of the Bill, and laid stress upon the fact that the Council had for years been seeking an opportunity to purchase the water-works, and they felt that at last they had a bargain which, in the course of a very few years, would very easily justify itself. The point to be borne in mind was that the Council were purchasing an income of £800 per annum, and that, viewed in this way, the actual structural value of the plant did not account for much. Yet there was the exceptional circumstance that the undertaking had been kept in such a state of repair that the engineer estimated its value at practically that of a new plant.

The CHAIRMAN said that, without expressing any opinion on behalf of the Committee upon the figures which had been placed before them in regard to either the details of purchase or future prospects, they were of opinion that the public interests of Lymm and the adjoining district which it was proposed to add would be served by the scheme proposed, and they found the preamble of the water portion of the Bill proved.

Mr. JEEVES then dealt with the gas portion of the Bill. He explained that in 1872 the then Lymm Local Board obtained a Gas Act for the establishment of works; and from these works a supply had been given ever since. The sum of £10,494 had been borrowed out of the total authorized borrowing powers of £15,000; leaving £4506 margin. In 1910, the Council borrowed £700 for land; so that at present the margin was £3806. With the exception of £494 outstanding on the £700 raised in 1910, the whole of the Council's borrowings in respect of their gas-works had been repaid, so that the Council were in the exceptional position of having gas-works entirely free from debt. They had, however, been advised that, quite apart from the proposed extension to Warburton, the works ought to be reconstructed, in order to make them up-to-date, and enlarged. In this matter the Council were in the position practically of asking to be authorized to establish new works as if they were starting afresh, because there was no outstanding debt on the old works—indeed, their position was more favourable than if they were starting afresh, because certain parts of the existing works could be made use of in order to reduce the cost of the new works. The argument in favour of the extension of the gas limits to Warburton was the same as in the case of the water supply—namely, that this district was rapidly developing, it was contiguous to Lymm, and at present there was no gas supply, and no likelihood of anyone else giving a gas supply.

Mr. *G. L. Welford* having given evidence on the preamble of this part of the Bill,

The CHAIRMAN said the Committee would sanction the extension of the gas limits.

Mr. *W. M. Carr*, the Engineer and General Manager of the Ormskirk Gas Company, whose firm has advised the Lymm Council, then gave evidence with regard to the proposed reconstruction of the gas-works. He pointed out that the sales during the past twenty years had doubled themselves; the quantity in 1894 being 12,300,000 cubic feet, while last year it was 23 millions. He believed there were great prospects of development in Lymm; but as the gas-works themselves were not in a very good condition, he strongly advised the Council, quite apart from future development or the addition of Warburton, to reconstruct them, as by up-to-date methods the cost of manufacture could be reduced considerably. He would propose putting down plant sufficient to deal with the prospective increase in consumption during the next twenty years; and this he assumed at the present rate of progress—namely, that it would nearly double itself in that period. In other words, an output of 40 million cubic feet was taken as the basis. So far as the present plant was concerned, one of the gasholders might be used for tar and liquor storage. The condensers were not in good order, nor was the purifying plant. Both required renewal immediately. For the purpose of the new scheme, borrowing powers of £20,000 would be necessary. This would represent a saving in working expenses of £700 a year to the Council. As a further instance of the possibility of economy in manufacture, he pointed out that at present 7 cwt. of coke was obtained per ton of coal, whereas 12 cwt. would be obtained from a modern plant; and while the gas made per ton of coal was 9800 cubic feet, this could be from 11,500 to 12,000 feet with a modern plant. Savings in wages and purification would also be made.

In answer to the COMMITTEE, witness stated that he did not anticipate that even if an electric supply works were established the gas undertaking would suffer; and he mentioned as an instance that at Ormskirk, since the electric light was introduced two years ago the gas consumed had increased by 30 per cent.

The CHAIRMAN asked what course witness would advise the Council to take if the Committee were not able to give the borrowing powers for the erection of new works.

Witness replied that the Council would then be in a serious position, because the works at present were in a very bad condition, and it would be very difficult to maintain a proper and sufficient supply.

The CHAIRMAN: Would you put it so high that it would lead to a collapse in the efficiency of the supply of the district?

Witness said he would.

The CHAIRMAN, after consultation with the Committee, said that, subject to details, the Committee were satisfied on this question, and passed this portion of the Bill.

THE CLAUSES ADJUSTED.

The clauses were dealt with seriatim on Wednesday; the water portion being taken first.

In regard to clause 13, which extends the limits of supply to the district of Warburton, the Local Government Board suggested that powers should be inserted giving the Rural District Council the right to supply if the Lymm Council did not carry out their obligation under the Bill within a certain period.

Mr. JEEVES pointed out that the Rural District Council did not ask for these powers, and that the parish of Warburton would be in no worse position in the hands of the Lymm Council than it had been in the past in the hands of the North Cheshire Water Company, who had never given a supply.

The Committee refused to make the condition suggested.

With regard to clauses 23 and 24, which prescribe 2s. per 1000 gallons for water supplied by measure for trade or manufacturing purposes where part of the building was occupied as a dwelling house, the Local Government Board made the objection that in the Model Bill the charge is only 1s., and suggested that 2s. should not be charged unless circumstances could be shown which justified it.

Mr. JEEVES said that in this case all the water had to be pumped. The Company already had a maximum charge of 2s., and were actually charging 1s. 9d.

The Committee allowed 2s. to remain in the Bill.

With regard to the gas clauses, the majority of these were in the form of those in the Model Bill, and no serious question arose with reference to them.

Discussion took place, however, with regard to the financial clauses of the Bill. In this section, powers are asked to borrow the amount agreed upon for the purchase of the Lymm Water Company, in addition to £10,000 for the extension and improvement of the water undertaking, and £20,000 for the extension and improvement of the gas undertaking.

Mr. *Carr* was recalled with regard to the gas borrowing powers, and stated that he had carefully gone through the estimates of the Gas Manager, and agreed with them. These showed an approximate expenditure of £20,000, which would have been more but for the fact that certain portions of the existing plant would be brought into use, as he had previously explained. He estimated the capital cost per million would be about £500 under these circumstances, against £800 if no part of the existing works were made use of. The present cost of manufacture and distribution was 2s. 4d.; but this should not exceed, and might perhaps be less than, 1s. 9d. per 1000 feet with modern plant. On a manufacture of 40 million cubic feet at the present selling price of 3s., there would be a net profit of 1s. 3d. per 1000 cubic feet, which would provide interest and sinking fund on a 6 per cent. basis and leave £1300 surplus. This, of course, was estimating in the future; but even assuming no increase, there would be a net saving in working expenses from the new works on the present output of 25 million cubic feet of £700 per annum.

Mr. RHODES suggested for the consideration of the Committee whether they should fix any amount in the Bill or leave it to the Local Government Board to sanction later.

The CHAIRMAN, however, said that the Committee would insert the figure of £20,000 in the Bill.

With regard to water capital, of £10,000, further evidence was given

by Mr. *William Beckett*, who said that the addition to the reservoir would be necessary almost immediately, and also certain mains.

The Committee allowed the sum of £10,000 to be inserted in the Bill for the purposes of the water undertaking.

Discussion then took place with regard to repayment; the period asked for being fifty years for the purchase of the Water Company's undertaking, sixty years for land, and forty years for the new water and gas capital, with five years for the costs and expenses of the Act. The Local Government Board objected to the fifty years for the purchase of the water undertaking; but Mr. Jeeves gave a number of precedents for this period.

The CHAIRMAN hinted that the Committee were inclined to grant all the periods asked for, subject to anything said in opposition by the Local Government Board.

Mr. RHODES argued that fifty years was excessive for a water-works which had been so well maintained, as was the case in this instance, and suggested forty years.

The CHAIRMAN asked Counsel what objections he had to taking forty years for the purchase of the water-works and the new gas and water capital, sixty years for lands, and five years for the costs of the Act.

Mr. JEEVES said he would earnestly ask the Committee for fifty years for the water-works, as the difference between forty and fifty years was 8s. per cent., which was a very appreciable matter.

The CHAIRMAN said that another point which had impressed the Committee in favour of the promoters was that an examination of the water-mains had shown them to be in practically as good a condition as when first installed, and therefore the Committee would grant the periods asked for in the Bill.

The last point raised by the Local Government Board was in respect of clause 144, which deals with the application of the revenue from the gas undertaking, and the disposal of profits, and meeting gas deficiencies. The Local Government Board wished to place a limit on the amount the Council could carry to the relief of the rates from surplus profits, on the ground that an outside district was being supplied, which would have no voice in the management of the undertaking. Outside districts, argued Mr. Rhodes, often said that the gas authority was making a profit out of them, but they had no representation upon the management. A provision of the kind he suggested prevented, or at any rate restricted, the limits of any such grievance.

Mr. JEEVES suggested that the difficulty would be met by making the maximum price 5s. instead of 6s. 8d.—the present maximum.

The Committee agreed with this suggestion, and inserted the 5s. maximum.

The Bill was then ordered to be reported for third reading.

EBBW VALE WATER BILL.

A Committee of the House of Lords, presided over by the Earl of KINTORE, commenced consideration of this Bill on Friday, May 2. The object of the Bill is to authorize the Urban District Council of Ebbw Vale to construct additional water-works.

Counsel for the promoters were Mr. J. D. FITZGERALD, K.C., and the Honourable EVAN CHARTERIS. The Usk Board of Conservators were represented by Mr. G. B. RAIKES; the Great Western Railway Company by Mr. L. B. PAGE; and a number of owners of fishery rights by Mr. LEWIS COWARD, K.C., Mr. TYLDESLEY JONES, and Mr. T. R. SYDENHAM JONES.

Mr. FITZGERALD, in opening, stated that in 1904 the Council constructed a reservoir known as the Carno reservoir; but the quantity of water which they were authorized to take from the River Ebbw by means of this reservoir had been found to be inadequate, with the result that an adit had been driven into the Llangattock Mountain at a cost of nearly £45,000. Unfortunately, although this adit had been driven a distance of some two miles, the additional supply of water had been most unsatisfactory; and under the Bill it was proposed to continue the adit to the other side of the mountain into the Claisfer Valley, and to take water from the stream bearing that name. The chief opposition to the Bill was on the part of the owners of fishery rights in the Claisfer stream; but the Council were advised that no damage would be done to the fisheries. Full provision was made in the Bill for compensation water to the extent of 500,000 gallons a day; and the stream would be improved by the works of the Council. The Council resisted, however, paying compensation in money as well as in water.

The CHAIRMAN expressed the opinion that it was wrong in principle for a water authority to go outside its own watershed unless there were strong reasons for it.

Mr. FITZGERALD replied that the Council's watershed was quite exhausted. There would otherwise be no object in going outside.

Sir *Alexander Binnie*, the Consulting Engineer to the Council, Mr. *G. Deacon*, who was Engineer for the adit already driven into the mountain, Mr. *E. Hill*, the Water Engineer to the Glasgow Corporation, Mr. *James Watson*, the Water Engineer to the Bradford Corporation, and Mr. *J. Cameron*, the Chairman of the Ebbw Vale District Council, were called in support of the Bill - the engineering evidence being in favour of the scheme.

The cross-examination of the witnesses was to the effect that money compensation should be paid as well as water compensation; but the evidence was that there were very few cases in which the double compensation was paid, although it was the old practice to compensate only in money.

On Monday, May 5, evidence was given by some of the petitioners against the Bill; but in one or two instances Counsel contented themselves with briefly addressing the Committee. The main point hinged upon the amount of compensation water which the Council should provide, apart from the question of money compensation, which was claimed by one or two millowners. On the former point, the demand was that the Council should provide as compensation water an amount equal to one-third the total quantity taken from the area; but the promoters refused to offer more than one-quarter. The point was made that any considerable reduction in the average dry-weather flow of the River Usk would be a serious matter, inasmuch as the pollution from the sewage would then be much greater. On behalf of the Usk River Conservancy, damage to the salmon spawning beds was anticipated by reason of the loss of the "freshes" due to the operations of the Council's compensation reservoir; and cases were mentioned of money compensation having been paid in similar circumstances, such as at Swansea and Abertillery.

Mr. FITZGERALD, in his cross-examination, emphasized the point that, whereas the average dry-weather flow was now 105,000 gallons, the Council would increase this to 500,000; and this would improve the conditions.

As regards the millowners, their case also was that a precedent existed in the Abertillery Bill, by which compensation was paid in money for any damage they might sustain.

Mr. FITZGERALD, in his final address to the Committee, said that the promoters proposed to give 500,000 gallons per day all the year round as compensation water, and there were no special circumstances which would take this case out of the general rule. As to paying compensation in money, he was quite prepared not to pay in water, and to leave it to all the petitioners to prove before an arbitrator the damage they had sustained. He did not for a moment believe that the amount he would have to pay would be anything like one-fourth or one-fifth the sum it would cost to construct the compensation reservoir. He maintained that the increase in the dry weather flow of the river would immeasurably improve the fishing, and emphasized the point that there was no opposition to the Bill from the local authorities concerned. The Council, he said, had already spent £40,000 in driving the adit into the Llangattock mountain; and the whole of this sum would be lost if they were not allowed to carry out the present scheme. Finally, he referred to an adverse report from the Board of Agriculture, which had only been issued the night before the Bill actually came before the Committee, and a week after the time it was originally intended the Bill should have been considered in Committee. It was clear that the gentleman who wrote the report had no knowledge of the facts, and had apparently drafted it from a perusal of the Bill and of the statements in the petition against it. It was usually the custom not to regard statements in petitions as facts until they were proved; and he protested against a report of this character being placed before the Committee.

After deliberation,

The CHAIRMAN said the Committee had decided that the Bill might proceed, subject to clauses providing that compensation water shall be delivered from the total area of 975 acres of a daily quantity of 660,000 gallons in a continuous flow every day of the week. The diameter of the main from the Claisfer Valley to the Council's area of supply must in terms be limited to 18 inches. Words must also be inserted to safeguard the petitioners, making it clear that want of water should not be a bar to their right to penalties for failure to supply the compensation water. The penalty would be increased from the £5 per day in the Bill to £25. The Committee saw no reason to insist upon any compensation in money.

Mid Kent and East Kent District Water Bill.—In the report of the proceedings on this Bill before the Unopposed Bills Committee which appeared in the "JOURNAL" last week (p. 415), it was stated that a new clause was inserted relating to water used in private motor-car garages, and that under it a charge of 10s. per annum would be made. We learn that the power which the Company have obtained in this respect enables them, where a hose is used, to insist upon the supply being taken by meter; but they have agreed that the minimum charge for water through the meter shall be 10s. per annum. A suggestion was put forward by the Local Government Board that the charge of 10s. a year should only be made if a hose were used. With regard to the opposition to the Bill, it might have been stated that, out of twenty-five local authorities concerned, there were only five who opposed, and they subsequently withdrew.

Rhondda Refuse Destruction and Electricity Scheme.

Among the opponents at a Local Government Board inquiry, regarding an application by the Rhondda Urban District Council to borrow certain sums, was Mr. Joseph Sprague, the Secretary of the Ferndale Gas Company. The amounts required by the Council were £23,400 for a proposed electrical undertaking, and £38,500 to erect and equip a refuse destructor at Dinas. With regard to the power which would be produced, it was stated that the Council had concluded an agreement with the South Wales Electrical Power and Distribution Company to send to the Company's cables the electricity from the refuse destructor between 6 a.m. and 3 p.m.; and a price had been agreed upon for this, as well as for the supply by the Company to the Council between 3 p.m. and 6 a.m. Mr. W. P. Nicholas, the Clerk to the Council, agreed that they paid a higher price for power than they were to receive; but he pointed out that they had the use of the Company's cables. Mr. Hammond, giving evidence as an electrical expert, expressed the opinion that the scheme would not involve any call on the rates, and added that "electric lighting would be cheaper than gas."

Cheaper Gas for Southport.—The Southport Town Council last Tuesday adopted a proposal of the Gas Committee that the price of gas should be reduced to a flat-rate of 2s. 6d. per 1000 cubic feet. Alderman Trounson, who proposed the motion, said he looked forward to a yearly reduction until 2s. was reached. The consumption of gas had risen by 24½ million cubic feet in the last twelve months.

Contaminated Drinking Water in Paris.—According to the "Matin" an outbreak of typhoid fever in the Latin Quarter of Paris, responsible for twenty deaths, has been traced to the carelessness of a plumber employed in the preparations for the Congress of Physical Culture and Hygiene recently held at the Faculty of Medicine. He connected a pipe leading from the building to the River Seine with the main water system, and by so doing contaminated the drinking water of a large area of the city.

LEGAL INTELLIGENCE.

ACTION AGAINST THE WANDSWORTH GAS COMPANY.

On Monday of last week, in the King's Bench Division of the High Court of Justice, before Mr. Justice A. T. Lawrence and a Special Jury, the case of the London County Council *v.* the Wandsworth and Putney Gaslight and Coke Company was heard. Plaintiffs sued the defendant Company for damages done to Wandsworth Bridge, the property of plaintiffs, on June 19, 1912, caused by the alleged negligent navigation of the defendants' steamer "Wandle" by defendants' servants.

The case for the plaintiffs was that on the date in question the "Wandle" about 4.30 a.m. was proceeding up the Thames fully laden with a cargo of about 1200 tons of coal, when the vessel collided with Wandsworth Bridge, causing serious damage to the bridge.

The defendants denied any negligence on the part of their servants. Their case was that, on the day in question, the "Wandle" was proceeding up the river at the hour named when a thick bank of fog suddenly developed and quite obscured the bridge and caused the collision. The accident, defendants said, could not have been avoided by ordinary and reasonable care and maritime skill. The channel in the way of the bridge had of late years been dredged and deepened so as to permit vessels to navigate up the river to Wandsworth; but the defendants alleged that the plaintiffs had failed to take the proper steps to maintain or strengthen the bridge pillars, which were of the lightest possible description, and not reasonably fit to support such a bridge.

Mr. ROCHE, K.C., and Mr. J. D. CRAWFORD were for the plaintiffs; Mr. BULLEN, K.C., and Mr. D. STEPHENS for the defendants.

A great deal of evidence was given on behalf of the plaintiffs, and it was said that the damage to the bridge was so great that the structure had to be closed for a long time, and the repairs cost some £5000. Plaintiffs' witnesses said that the weather at the time of the collision was clear. On the other hand, the evidence of defendants' witnesses went to show that there was a bank of dense fog just by the bridge, which prevented the captain seeing the bridge clearly.

His LORDSHIP, summing up, said that some of the witnesses declared that there was a thick fog at the time of the accident; while witnesses on the other side declared that there was only a summer haze. It was admitted that near the bridge there were strong currents in the river. The fog and the currents were put forward by the defendants to account for the accident. Although it was admitted that the fog was not so thick as to render it improper to navigate at all, it was sufficiently dense to prevent any one on board other vessels and barges near the spot seeing the accident. The vessel was exceptionally large for use so high up the river, and would be less easy to manage than a smaller boat.

The Jury, after some deliberation, found for the plaintiffs. The question of damages was to be referred (if not agreed on between the parties) to a referee.

DERWENT VALLEY WATER BOARD ARBITRATION.

Last Wednesday, the King's Bench Divisional Court, consisting of Justices CHANNELL and COLERIDGE, heard an application on behalf of the Corporation of Sheffield to set aside an award made by Mr. C. A. Russell, K.C., in connection with the Derwent Valley Water scheme, or, in the alternative, to declare that it might be remitted back for further consideration. The terms of the award were given in the "JOURNAL" for Nov. 12, 1912 (p. 534).

Mr. BALFOUR BROWNE, K.C., and Mr. DRUCQUER appeared for the appellants; Sir A. CRIPPS, K.C., and Mr. M'CARDIE represented the Leicester Corporation; Mr. MACMORRAN, K.C., and Mr. TYLDESLEY JONES, the Corporation of Nottingham; Mr. TOMLIN, the Corporation of Derby; Mr. T. C. P. GIBBONS, the Derwent Valley Water Board.

Mr. BALFOUR BROWNE said the dispute arose out of an Act passed in the year 1899, when three Bills were promoted by the Corporations of Derby, Leicester, and Sheffield respectively for the purpose of constructing certain water-works. Each Corporation proposed to go to the upper waters of the Derwent for a further supply of water. Their claims were of a different nature. Derby and Leicester said they were in the watershed of the Derwent; while Sheffield, which was outside, said that by reason of proximity it had a right to some of the water. Quite early in the proceedings on the Bills, the Chairman of the Committee to which they were referred said he did not think it would be an easy task for any of the parties to persuade them that Sheffield must be entirely excluded from the gathering ground, and that it would be better to come to an agreement. After this hint, the parties discussed the matter, with the result that an arrangement was come to. The provisions of the three Bills were consolidated into one Act; and a Joint Board was constituted to consist of thirteen members—three to represent Derby, four Leicester, three Sheffield, two Nottingham, and one the county of Derby. A section was also introduced appointing a standing Arbitrator, who was to decide any question that might arise between the constituent authorities. The Joint Board carried out works at a cost of £3,229,246; and the question then arose as to the contribution to be paid by the different parties. Section 84 of the Act dealt with the apportionment of the water, and section 85 with the allocation of the expenditure, which was to be borne in the ratio of the statutory proportions of the constituent authorities. Although Derby and Nottingham were to have the right to demand water, it was only on payment of 4 per cent. of the cost of procuring the supply and obtaining the Bills. When the works were constructed, the yield of water was expected to be 33,000,000 gallons per day, of which 5,000,000 gallons were to go to the county of Derby, 1 million gallons to Derby, 6,833,333 gallons to Sheffield, 9,763,467 gallons to Leicester, and 3,903,200 gallons to Nottingham. The total cost of making two reservoirs and carrying out the works came to £3,229,246; and the question arose as to how the different parties should contribute towards it. The representatives of the Board decided that they should contribute in "the ratio of their statutory proportions." From this, the Sheffield Corporation dissented; and the matter was referred to the standing Arbitrator. He had construed the word "land," in section 85, as meaning all land, whether or not it was for joint use or benefit; and he ordered the Sheffield Corporation to pay one-quarter. The effect of this was to make them pay £55,927. They contended that the Arbitrator had come to a wrong conclusion on this and some other minor points, and that the award should be remitted back.

Sir A. CRIPPS, in supporting the award, said that, in order to have a joint Bill, it was agreed that the different Corporations should jointly bear the cost of the purchase of land and construction of the reservoirs; and he submitted that the Arbitrator rightly decided that the expenditure on land was to be shared in the ratio of the different proportions, as also the cost of constructing the reservoirs, quite irrespective of whether or not they were for the benefit of one party.

Mr. MACMORRAN also supported the award; urging that all parties were equally interested in carrying out one entire scheme.

Their LORDSHIPS upheld the award, and dismissed the appeal, with costs.

Dangers of Electric Wires.

In the King's Bench Division of the High Court of Justice in Ireland last Tuesday, Lord Chief Baron Palles, delivered judgment in refusal of an application made by the Dublin United Tramways Company for an order setting aside a verdict awarding £40 damages to Thomas Flanagan, a car driver, for injuries sustained through the accidental falling upon him of an electric wire on the tramway route at College Green. He said that, notwithstanding the decision of the Privy Council some twenty years ago, it was now settled, both in England and in Ireland, that an action would lie for injuries caused by fright. In the present instance, a dead wire fell on the plaintiff; and he, taking this in connection with the illumination caused by the derangement of the wire, came to the conclusion that a live electric wire had fallen upon him. The wire, the moment before it fell, was a live one; but it was dead before it touched the plaintiff. His Lordship was perfectly convinced that Parliament must have been satisfied that, if due care were used in working the electrical system, there would not be much public inconvenience, and that the reason for passing the Act was that the public advantage would outweigh any chance of public danger. He, therefore, held that the breaking of an electric wire in such a way that the end of it could fall and touch passengers on the highway was recognized by the Legislature as likely to be an exceptional occurrence; and, in his experience, this view of the Legislature was correct. A jury was at liberty to show that no means could be taken to prevent the trolley pole breaking the wire; but in the present case no evidence to this effect was tendered. Mr. Justice Gibson and Mr. Justice Kenny concurred.

Gas-Heated Boilers.

The business of water heating by gas is going on apace. Reports reach us of orders being constantly received by gas undertakings for gas-heated circulating boilers and other water-heating appliances. Even in the case of a small village undertaking, the manager mentioned to us the other day that he had fixed two gas-heated circulating-boilers. Mr. Thomas Potterton, of the Cavendish Works, Balham, tells us that last year the demand for boilers trebled; and, in consequence, he has had to enter upon a reconstruction of works, in order to make room for additional workmen. The normal stock has been depleted; and this has to be replaced, as well as provision made for the extending demand.

Salford Gas Undertaking and the Rates.

Contrary to what was at one time expected, it is now understood that the rates of Salford during the ensuing year will not show an increase. This result is stated to be due to the Gas Committee. In spite of reduced prices for gas to large and small consumers, and the fixing and supply of cooking-stoves at what are really nominal rents, the Gas Committee have resolved to contribute to the relief of the rates no less a sum approximately than £44,000, amounting to a rate of 11d. in the pound. "Satisfactory as this achievement must be," remarks the "Manchester Courier" in referring to the matter, "it is important to remember that after this year the Gas Committee will not again be able to contribute so lavishly in the ratepayers' interests. The Provisional Order, carrying now the force of an Act of Parliament, limits to £10,000 per annum the future contribution to the relief of rates, but, contrary to expectation, only comes into force in the year 1914. After having due regard to reserve and redemption account, and prior to commencing the *régime* enforced by the Provisional Order, the Gas Committee have been enabled to hand over the huge sum mentioned for the ratepayers' relief."

Cape Town and District Gas Company, Limited.—At the ordinary general meeting of this Company, to be held to-morrow, the Directors will report that the past year's working resulted in a profit of £15,089. Adding the amount brought forward (£2129), there is a total of £17,218. Out of this sum, debenture and debenture stock interest paid and accrued to Dec. 31, 1912, has been provided, £718 has been written-off for depreciation, and £5000 transferred to the reserve and contingency account—leaving £2413 to be carried forward. Municipal electricity now competes with the Company in the whole of their district; and during the past year current was supplied at a considerable reduction in charge for every purpose—in some cases at ¾d. per unit, though the lowest price of coal obtainable for its generation was 25s. per ton. Unfortunately, coal suitable for gas making cannot be obtained at anything like this figure. There was a decrease in the make of gas last year; but the quantity sold was higher than before, the leakage having been reduced.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Meeting was held last Tuesday, at the London Offices, No. 21, Austin Friars, E.C.—Sir CHARLES J. JESSEL, Bart., in the chair.

The SECRETARY (Mr. Robert W. Wilson) read the notice convening the meeting, the Auditors' report, and the scheme for the appropriation of the profits.

The Directors' report [which has already been published in the "JOURNAL"] and the balance-sheet were taken as read.

THE INDISPOSITION OF THE EX-CHAIRMAN.

The CHAIRMAN: It is customary for the Chairman on these occasions to deal with the half year which is the subject of the report and accounts, and then to proceed to mention the various circumstances of interest to the proprietors that have occurred during the current half year. I think you will appreciate my motives for departing from this custom on this occasion, because it is necessary for me to explain my presence in the chair to-day. My predecessor, Mr. John Horsley Palmer, was in far from good health towards the end of last year. He stuck to his post; and it was only in the middle of January of this year that, on the insistent advice of his doctor, he went to Teneriffe. Finding, I am sorry to say, but little relief, he came home again early in March in somewhat indifferent health. With his characteristic patriotism, and with his characteristic devotion to your interests, he felt it was no longer possible for him to leave the affairs of this great Association captainless; and he thought it incumbent upon him to resign the position he had held for as many as ten years. Mr. Palmer, whose father and grandfather were both members of the Board, came to us as a Director as long ago as 1875; and it might perhaps be of interest to you if for one moment I contrast the Association as it was at the time he was elected to the Board, and as it is at the present moment. At the time he joined the Board, the capital of the Association was £2,800,000, in 56,000 shares of £50 each, each with a liability of £6 5s. attached. The dividends paid thereon amounted to £216,000. At the present time, we have a capital of £4,940,000; and the amount we distributed last year was £444,600. I must also in this connection draw your attention to the fact that, of the additional capital of £2,490,000, all except the sum of £300,000 was found out of the resources of the concern itself. In the year 1875, there was £100,000 of 3 per cent. Consols invested outside our business. By looking at the balance-sheet, you can find out quite easily for yourselves what there is now; the amount is something like £3,078,361, exclusive of land. Well might it be said that, when Mr. Palmer came, the Association was a city of bricks, and he left it a city of marble. Anyhow, I think you who have experienced the ability and geniality with which Mr. Palmer presided over us for the last ten years, and the qualities which marked his conduct in the chair at your meetings as at our Board meetings, will feel the same regret as the Directors that he has found it impossible to be with us to-day. [Hear, hear.] We can only hope that the rest he is enjoying at present will bring him to us again, and give us the benefit of his long and ripe experience in business affairs generally, and in the matters of this Association in particular.

A NEW DIRECTOR, AND AN HONOUR.

Unfortunately, this is not all that has to be said with respect to the Board since the beginning of the year. A great blow came to us in the month of February in the death of our colleague, Mr. Leonard Wilkinson. He was to us a valued colleague, a genial companion, a good sportsman, and a man whose opinion on legal subjects when they arose from time to time was always a well-considered one, and highly valued by his colleagues. We shall sorely miss him from among us. We have elected to the vacancy Sir Guy Fleetwood Wilson. Sir Guy had a distinguished career in this country in the public service for many years. For the last five years, he has been what we might almost term the Chancellor of the Exchequer for the Indian Empire, in which capacity he has rendered service to which I need not allude, as anybody must have seen who has read his newspaper during the last few months, or, at any rate, anybody who has had reason to consider the claims of his budgets during the past five years. Sir Guy has been known to me for upwards of a quarter of a century, and is well known to several of my colleagues; and we are looking forward to having him among us, and having the advantage of his long experience in public affairs, his keen intellect, and his ripe experience. There is one other personal matter. I daresay many of you saw that His Majesty conferred honour upon one of us on the 1st of January last. [Hear, hear.] Sir Corbet Woodall is a member of many boards of gas undertakings; and many other gas boards would willingly claim him as a director, were it possible. However, with none (if I may be allowed to say so) has his connection been so long and intimate as with us; and by none has this honour—an honour somewhat tardily bestowed upon him—been so welcomed as by his colleagues of this Board. Having now explained my presence in the chair to-day, as well as other personal matters, I can only say that I appreciate the honour I enjoy—an honour my colleagues have been so kind as to bestow upon me—of having been elected to the chair. I shall do my very best to justify their choice, both to them and to you.

RAPIDLY RECOVERING LOST GROUND.

I will now, ladies and gentlemen, pass to the report. Referring more particularly to its technical side, it is very clearly demonstrated that, although the cessation of operations both at Vienna and Aix-la-Chapelle has made direct comparisons almost of no value, the business of the Association at the remaining stations continues to develop satisfactorily; and one may safely prophesy that, in a comparatively short time, the ground lost, in so far as the volume of business is concerned, by the discontinuance of business at Vienna and Aix, will soon be regained. Take the output of gas. The increase in the period under review was, at the other stations, 10 million cubic metres, or 353 million cubic feet. This is no less than 40 per cent. of the total output of both Aix and Vienna in the last six months of their connection with us. Again, as regards consumers, we lost 64,874 at Aix and Vienna; but the other stations have recouped the loss to the extent of 19,000 new consumers, or 29 per cent. Another proof of the rapidity with which we are making up lost ground is found in the operations in the way of main-laying. We had 442 miles of mains at Aix and Vienna; and the other stations at the end of the half year had an increase of nearly 100 miles—to be exact, it was 96 miles—and these mains were for business in new districts. Then, further, the business purchased at Anderlecht (which is alluded to in the report) came into our possession on Sept. 1; and the statistics in connection with it are not included in the comparisons already given. Anderlecht represents by itself about 14 per cent. of the capacity of Aix and Vienna combined. Moreover, in the way of new contracts and contract prolongations, we have 22 entirely new contracts for new districts, and four prolongations of existing contracts; and these together make a record for six month's operations. It may be interesting to you to know that the expiration of our longest contract takes place in 1982. May we all live to see it! [Laughter.]

COAL AND FREIGHTS.

The information which I have given you, and which the report gives, about exhausts all I have to say with respect to the operations of the Association in the six months under review; and so I will now go on to say a few words respecting the balance-sheet. To put the position briefly, the net loss involved by Aix and Vienna, with the charges for pensions, was in round figures £70,000. Now looking at the balance-sheet, you will see there is only a decrease of £39,000, which shows that the other stations have improved to the extent of £31,000. Do not for a moment think I can promise you that this is going to continue for ever and aye. On that subject, I may have a few words to say in a moment. The fact of the matter is this: I daresay you will remember that a year ago I referred to the valuable services rendered to the Association by the Secretary in making full provision for the coal strike. But I did not on that occasion mention that the service he rendered was one which was going on up to the present date—that is to say he bought coal in 1911 for two years. It is true that in the six months under review coal came out at 5d. per ton higher, because we had to make purchases on account not of our want of contracts with our coal shippers, but because we could not obtain delivery, and consequently we had to make certain purchases at the last moment at an increased price. This made an average difference, as I have said, of 5d. per ton. We are enjoying at the present time—perhaps we are just about to begin to cease to enjoy—the advantages of the 1911 price. I do not say the shippers enjoyed the position as much as we did. It is sometimes, and I should think generally, difficult to get any expression of opinion from coal-shippers; but even we got something from one of them on this occasion. It was only in the shape of a postscript. The letter covered an invoice for coal; and the postscript was as follows: Every cargo against this contract shows a dreadful loss. In the words of Macbeth 'This is indeed a bloody business!" [Laughter.] I may say that the whole of our office staff was engaged with Mr. Wilson, out of office hours, in trying to verify this quotation, without success; and they failed to meet it with any adequate reply. [Laughter.] But at all events this *cri de cœur* did show what the shippers thought of the strategy of Mr. Wilson in obtaining contracts for two years. What I want to go back to is this, that we have had to buy, during the present year, our requirements largely—in round figures, about 1 million tons of coal—at an enhanced price, in comparison with 1911, of about 3s. per ton. Unless, therefore, the value of residuals continues to increase, we must necessarily feel the effects—not (as I have already said) in the current half-year, which I am firmly convinced is going to be a satisfactory one, but certainly later on when we do feel the full burden of these higher prices.

THE AVAILABLE PROFITS.

I do not think that any good purpose could be served by wading through the different items of the balance-sheet. Nearly all these items are affected by the liquidation figures of the two stations we have lost; and you must understand that, though the figures for the corresponding half year are given, a good many of the items do not compare upon what I may call an equal basis. There is, however, one item which is comparable—that is, the amount of profits available for appropriation. It would, I think, be rather a good thing if on this occasion I read some correspondence exchanged between one of our oldest and most esteemed proprietors—Mr. Robert Fox—and myself. Mr. Fox wrote on April 16 to the Secretary. It was a brief note, and very much to the point. It was as follows:

I.C. Gas for Year 1912.

Profits		£484,000
Less—Pension fund	£80,000	
Shareholders	444,000	
		524,000
Deficit		£40,000

To divide more than we make seems hardly acting on the principles which, for nearly a century, have made the good old I.C.G. what it is.

The Secretary sent this communication on to me. He thought I was capable of answering it. I hope I was. However, I wrote on April 18 as follows:

Mr. Wilson has forwarded me your letter of the 16th inst.

I admit at once your calculations to be correct; and the effect of the proposed distribution will be to rob the carry-forward of about £40,000.

About twelve years ago, we had to take a similar sum "in two bites" from the dividend equalization fund. So much for precedent.

But, on this occasion, we are in a much stronger position. We are robbing carry-forward not to pay dividend, but to keep up our contributions to the pension fund, and the amount appropriated for dividend is *not* in excess of the profit available—a most important point of difference. Owing to shutting-down our works at Vienna and Aix, our pension list has grown greatly—over £48,000 (per annum) in 1912 is the total; and it will exceed

£50,000 for 1913. We knew this, of course; and Mr. Palmer has told the shareholders that nothing less than a fund of £1,000,000 capital will satisfy the Board. We are halfway to this now, and are anxious not to discontinue the habit of appropriating £80,000 per annum to this fund. Unless anything unforeseen occurs, particularly in the shape of increased net cost of coal, I do not anticipate we shall have any difficulty in maintaining our dividend, and putting £80,000 to the pension reserve for 1913, without robbing the carry-forward or dividend equalization fund.

Mr. Fox replied on April 21:

The contents of your letter of the 18th are of much interest; and I thank you for writing.

Doubtless the Directors are wise to build up the pension reserve to £1,000,000, in view of present liabilities, and the prospect of their increasing in volume. We must look on this as the first claim.

The uncertainties of the political world and of the labour world, added to the high level of coal prices, all show the importance of keeping the financial position strong and unassailable.

Dividend equalization fund used to be added to out of surplus profits year by year. Now for several years it has remained stationary; so it is all the less open to depletion.

The rest of the letter is personal. I do not think I need go further than my letter, which fully explains the views of my colleagues and myself on this point.

A SERIOUS LOSS.

I should now like to say a few words as to the current half year; there being one or two matters of importance that have occurred since January. Most serious, and a very serious thing, was the loss in March of Mr. Ludwig Delbrück, our representative in Germany. If this had occurred ten years ago, it would have been a more appreciable loss than it is to-day, because, during the 23 years that he acted in succession to his father as our representative in Germany, the great work of consolidation, prolongation, and unification of our various profitable contracts in the neighbourhood of Berlin have been almost carried through. There are only one or two instances where work in this direction has still to be done. For all that, we have lost a big man, a great friend to the Association, a fine business man, and a fine negotiator. It will be a difficult matter to replace him.

A GASHOLDER QUESTION.

In connection with Berlin, there is one good piece of news I have to give you—that is, with respect to the gasholder at Schöneberg, of which you have heard once or twice. I need not go through the history of the trouble. All I wish to tell you is that the Minister of Commerce has given his verdict in our favour; so that we shall now be able to make use of the holder in a very short time.

THE BELGIAN STRIKES AND LOYALTY OF THE ASSOCIATION'S MEN.

I should also like to mention the Belgian strikes. These strikes hung over us a bit, and made some people a little nervous about our position, both at Antwerp and Brussels. But the great event passed over happily without affecting us in the least. Not a single man left any of our works either at Brussels or Antwerp. [Applause.] Our Engineers, both at Brussels and Antwerp, did everything possible to prevent any disturbance taking place; and we are grateful to the authorities for their support. They put themselves in communication with the mayors and police of the various communes in which the works of the Association are situated. We entertained some of the civic guard for more than a week at one or two of our works. I hope they had a good time of it. However, all has passed well; but at the same time I think much is due to our representatives there, who prevented anything in the shape of strikes taking place, and interrupting the supply of gas which we are bound to give to our consumers, and those with whom we have contracts.

I will now formally move—That the report of the Directors upon the affairs of the Association, together with the scheme for the appropriation of the profits which has been read, be received, adopted, and entered upon the minutes.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion, which was at once unanimously carried.

THE DIVIDEND.

Proposed by the CHAIRMAN, and seconded by Mr. ROBERT TINDALL, a dividend of 4½ per cent. for the half year was declared upon the £4,940,000 stock of the Association, less income-tax.

DIRECTORIAL RE-ELECTIONS.

Moved by the CHAIRMAN, and seconded by Colonel H. LE ROY-LEWIS, Mr. Tindall was re-elected to his seat at the Board.

The DEPUTY-CHAIRMAN moved that Sir Charles Jessel be re-elected a member of the Board. He observed that, although not speaking strictly to the motion, perhaps the proprietors would allow him to explain how Sir Charles came to occupy the chair. On the lamented illness of their late Chairman (Mr. Palmer), it was his (Mr. Lucas's) pleasing duty to propose Sir Charles as successor to the chair; and this was seconded by Sir Chandos Leigh, and carried unanimously. They felt that in Sir Charles they would have a Chairman who was completely cognizant of the minutest details connected with the Association, and that those proprietors who were acquainted with Sir Charles would feel convinced that it was in the interests of the Association that he should take charge of the helm and management of the business. He could assure them that, during the brief period that had elapsed since Mr. Palmer's resignation, and the assumption of office by Sir Charles, they had been fully justified by the manner in which he had carried on the business. He thought the speech Sir Charles had delivered that day—business-like, and very much to the point—was proof of the wisdom of the action taken by the Board.

The Hon. Sir E. CHANDOS LEIGH, K.C.B., K.C., seconded the motion, and it was cordially passed.

Moved by the CHAIRMAN, and seconded by Sir CORBET WOODALL, Mr. J. H. Birchenough, C.M.G., was also re-elected.

MERITED THANKS.

Sir CORBET WOODALL remarked that the Chairman desired him to propose a resolution which he always undertook, when asked, with great pleasure, but with the presentation of which he was never satisfied. It was that the best thanks of the proprietors be given to the officers, both at home and abroad, for their services during the half year. It was quite unnecessary to say anything about the officers at home. They had heard from their Chairman a well-deserved tribute to their Secretary; and they all knew how exceedingly well the duties of the office were performed by the staff serving under Mr. Wilson. In regard to the officers abroad, he thought it was of the utmost importance that they should understand that the resolutions the proprietors passed to them from time to time were no mere formal matter. That they should realize that the proprietors did appreciate in the fullest possible way the services their officers rendered, and that they desired that their prosperity should go hand in hand with the prosperity of the undertaking, were, he thought, matters of great moment, whether those officers were Englishmen, or citizens of the country in which their work was carried on. Many changes had taken place comparatively recently. They had lost from among their old officers by retirement, Mr. Salomons, of Brussels, Mr. Brender à Brandis, of Antwerp, Mr. William Drory, of Frankfort, and others he could not for the moment remember. But these were three very important officers. They had served the Association through a long term of years, and all of them had retired with tangible evidence of the gratitude that the Directors and the proprietors felt towards them. In their place, the Board had elected younger men from among the staff; and he thought he might say that, although they had lost the ripe experience of the older men, the staff was never in better condition than to-day. During the time, he (Sir Corbet) had had the honour of being connected with the Association, they had lost every member of the family of Drorys, to whom the Imperial Continental Gas Association owed so much—eight brothers who were in the service of the Association when he joined it. Mr. William Drory was the last of them; and while still in the flesh, he was now absent from them as an engineer of the Association. He (Sir Corbet) had just returned from visiting four of the principal stations of the Association. He was greatly impressed during this visit with the excellent manner in which the work on the Continent was being carried on. At one of the stations, the chief of the undertaking was absent on an important mission in America. But the work was being carried on there, so far as he (Sir Corbet) could judge, just as efficiently as if the chief had been present. He had heard it said that proof of good management of an undertaking was when it went on as well when the chief was absent as when he was present. This clearly was subject to limitations. However, the excellent loyalty and good fellowship that obtained among their staff accounted for the fact that the work did go on well even in the absence of the chief. At another station he found new works just recently erected by the Resident Engineer. It was a model of economical construction, and excellent management. Regarding the stations in Belgium, the Chairman had told them of the anxiety that had been felt there in connection with the strike. Excellent provision had been made all round by their Engineers to meet the strike if it came on. It was a tribute to what the men felt towards the Association—and they only felt towards the Association what they knew of it through their officers—and to their confidence in the Association, that none of them left. He (Sir Corbet) was there about a week before the strike; and the cheerfulness with which all the officers looked forward to it, and their perfect confidence in the result, were very striking. Under the circumstances he had the greatest pleasure in proposing that the thanks of the proprietors be passed to all their officers and to their men.

Mr. J. H. BIRCHENOUGH, C.M.G., in seconding, said this was a motion to which he always spoke with infinite satisfaction. He felt, when he visited their stations abroad, that their officers rendered them service which could never be paid for in the ordinary way. The Association, he believed, paid them well. They let their officers' prosperity progress equally with their own; but their loyalty and devotion to the Association was such that no money value could be set upon them. As Sir Corbet Woodall was speaking about the services of the officers, a little incident occurred to him which happened some years ago, which pictured in most vivid tones the loyalty of their servants. His wife and himself called upon the widow of one of their most distinguished managers, and this lady was living in a flat, but she said, with tears in her eyes, "this is the first time since our marriage forty years ago that I have lived outside the works of the Association. My consolation is I am still living in its territory." When this spirit animated their officers' wives, it was not surprising that the Association were well served by the husbands.

The motion was unanimously carried.

A NEW AUDITOR.

The CHAIRMAN said the next business was the appointment of an Auditor in the place of the late Mr. Gurney Fox.

Mr. BERNARD F. HARRIS moved that Mr. Chapman Frederick Dendy Marshall be elected to the vacancy. He remarked that the proprietors might have complete confidence that they would be as well served by Mr. Marshall as they had been by their late friend Mr. Gurney Fox. Mr. Marshall was a man of figures, besides one who had taken a degree at Cambridge.

Mr. GILES T. PILCHER seconded the motion, and said he heartily agreed with the nomination, and with the remarks of Mr. Harris.

Sir JOHN RUNTZ, before addressing himself to the subject before the meeting, said he should like to say, with regard to the enforced retirement from the chair of their friend Mr. Palmer, that those who had attended the meetings as he (Sir John) had done now for many years had seen his familiar figure, and had found him always courteous, always keen. He well filled the chair in more senses than one. The proprietors were glad to know they were retaining his services, because, as the Chairman had said, the Palmer family had been connected with the Association for many generations past. It was said that there was a silver lining to every cloud. In that sense, the proprietors welcomed Sir Charles Jessel to the office. The business was going on by leaps and bounds; and the Board had done the right thing in selecting Sir Charles for the chair. Coming to the matter before them, this was the first time, within his recollection, that they had had anything like opposition to the filling of the post of Auditor to the Company. He was going to propose a name which was that of his own son, Sidney

Westwood Runtz, a chartered accountant, of the firm of Jackson, Pixley, and Co. For many years he had been actively engaged with that firm in the City of London, and in the country generally and abroad. He had visited the four continents of the globe in a professional capacity. All business men and women would surely agree in this, that it was especially imperative, when they had such gigantic figures to deal with as those which they had now in their Association—the grand total of their finances came to nearly 9 millions—that professional advice and supervision should be obtained in connection with them. All their great commercial undertakings—railways and even companies in existence before the Companies Acts came into force—were now appointing professional auditors to audit their accounts. Therefore, he thought he was doing a good service to the Association in proposing his own son for the position, in view of his qualifications. It might be thought somewhat unusual for a father to propose his son; but he hoped his fellow-stockholders would view the matter in the same light that he (Sir John) did.

Sir Ernest Clarke said he had been connected with the Association now for something like thirty years. He knew several members of the Board; and he did feel that the time had now come when a young man—a man of talent, a man who had professional qualifications—should have the important post of Auditor placed in his hands. As Sir John had well said, there were now very large figures with which to deal. This was an old Company; and it was absolutely desirable that the splendid reputation it had built up during all these years should be maintained. He could not but think, when they had the combined facts of the son of a man who had been associated with the Company for many years and the requisite professional attainments, it was desirable they should elect him as Auditor. He had pleasure in seconding Sir John Runtz's proposal.

A vote by show of hands resulted in favour of Mr. Runtz.

Mr. Harris thereupon asked for a poll to be taken.

[A poll was taken at the close of the meeting, when 2183 votes were recorded in favour of Mr. Marshall, and 1410 votes in favour of Mr. Runtz. Mr. Marshall was therefore duly elected.]

Thanks to the Directors. Mr. Palmer's Illness.

Sir Ernest Clarke said the proprietors would like to express their grateful thanks for the care and attention the Chairman and Directors had given to the affairs of the Association. He moved a resolution accordingly.

Sir John Runtz seconded the motion, observing that it was a great delight to the old shareholders still to see the faces of men on the Board who had carried out their duties through trying periods, and had brought the Association to the grand position it now occupied. Under their new Chairman, he was sure they would not go back.

The motion was cordially carried.

The Chairman, in replying for his colleagues and himself, said he could not claim to be the third in generation on the Board, as could his predecessor. If, however, he unfortunately had not inherited a seat on the Board, he married into a seat at the Board, because his father-in-law, and the father and grandfather of his father-in-law were all members of the Board. He should have great pleasure, when Mr. Tindall and himself went abroad in a few days' time to visit the important stations, in conveying to the staffs the kind way in which the proprietors had expressed their appreciation of the services of officers and men in the past half year.

Mr. Samuel Spencer asked if the Chairman could give the proprietors any information as to how Mr. Palmer was now.

The Chairman replied that Mr. Palmer was a great deal better than he was when he came back to this country from Teneriffe. He was now in what he might call the convalescent state, and was hoping to be able to leave home for Folkestone in a few days' time, and there he would stay and recuperate. Mr, Palmer asked him to excuse his absence from the meeting that day, and to say he hoped soon to be back again.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

Gas Profits and the Rates.

Though it was recognized by those who followed the discussion at the last meeting of the Nottingham City Council, when the annual report of the Gas Committee embodying record results was dealt with, that Alderman A. Ball, the Chairman, was upon incontestably safe ground in suggesting under present circumstances a postponement of any further consideration of the question of a reduction in the price locally charged for gas, the feeling was none the less unmistakable that Mr. Ernest Richards had established a good case in support of his adverse criticism of the present high rates. The position of Sheffield, with its lower charges both for illuminating and power purposes, had been often previously cited to the disadvantage of Nottingham and not without relevancy, seeing that the authorities in the two towns are pretty well on an equality as to possible available sources of coal supply. But Mr. Richards, in citing facts in support of his contention, now travelled beyond the Cutlery Metropolis, bringing into the picture the Manchester rates, which tell in favour of the smaller as well as larger consumers. In Nottingham the ordinary consumer was charged 2s. 4d. per 1000 cubic feet while slot-meter customers received 27½ cubic feet for 1d. In Manchester, however, slot meter consumers had 37 cubic feet for 1d., while general consumers were charged 2s. per 1000 cubic feet. Solicitude for the employees' welfare finds frequent expression in the Nottingham City Council debates; and Mr. Richards touched a familiar topic when he criticized the arrangement under which carbonizers still worked seven full shifts a week. But Alderman Ball had no difficulty in demonstrating that the sympathy was misplaced; pointing out that the men were paid time-and-a-half for the seventh shift. Upon no account, therefore, would they give it up, much as the Committee might like to see Mr. Richards's idea realized, of only six shifts being worked.

The gravamen of the complaint which Mr. Richards once more formulated, in pursuance of that which has now become a recurring yearly custom, lay in its application to the humbler class of their customers, especially the users of slot-meters. He contended that the prices charged generally in Nottingham were inordinately high considering that a gross profit of 35 per cent. was made upon the gas undertaking—a rate which, he quietly added, was almost unthinkable to those who were engaged in the staple industry of the town. Moreover, he urged the unfairness of the present system under which, when, as in the past year, a profit of over £72,000 was made, gas consumers were called upon to pay largely towards the reduction of the district rate for the benefit of many who did not use gas at all. He advocated that Manchester's example of a substantial reduction in the price charged should be followed.

Alderman Ball, while expressing his sympathy with the demand, reiterated that the time was scarcely opportune at which to take a revision of rates into consideration. With a certain increase in the price of coal, and a falling market in residuals, it would be better to postpone the matter; and his promise that whenever it was thought wise to do so, the Committee would recommend a reduction, met with general acceptance by the Council. Sir John Turney, who, as Chairman of the Electricity Committee, has had experience of the extent to which the increased price of coal has adversely affected the profits of this branch of municipal enterprise, was emphatic in his advice not to reduce the price of gas one farthing until the new works at Radford had been got into order. While observing that they ought all to be thankful that an undertaking of such magnitude as that relating to the gas supply was managed on such good lines, he reminded the Council that, if they went on spending money as they were doing, they would need all they could get out of the gas and tramways; and he jocosely added that they would want a great deal more than they would ever get out of the Electricity Committee.

Albeit in support of their protest arising out of another matter, the Socialist members voted against the report. Incidentally, a protest raised against the Finance Committee peremptorily annexing from the profits of the gas undertaking more than the Committee originally proposed to give—the latter suggesting £34,000 and the demand being for £39,000, which was conceded—elicited from the Chairman the statement that, as he understood the position, if the Finance Committee wanted the money, they could demand it. At the same time he added the satisfactory assurance that the Gas Committee had plenty of money in hand with which to efficiently carry on their business. Indeed, he declared, they were never in a better position than now. The statement is eminently encouraging: but the feeling is none the less pronounced that the process of raiding gas revenue in aid of rates has been resorted to in Nottingham to an extent which suggests little consideration for consumers.

The New Vertical Retort Installation.

Some disappointment has been occasioned at Nottingham that, through unforeseen circumstances, the installation of the new Glover-West system of vertical retorts now in progress at the Radford works cannot be completed by the period originally arranged. It was hoped that the plant (of which a detailed description has appeared in the "Journal") might be in operation soon after Midsummer; but, as explained by Mr. John Wilkinson, the Gas Engineer, in his recently-issued annual report, the Contractors have unfortunately experienced serious delay in obtaining deliveries of iron and fire-clay materials. It has also been found necessary to adopt special precautionary measures to meet the large quantity of water encountered in the excavations; but he sees no reason why the plant should not be ready by the end of September.

Meanwhile, significant evidence is forthcoming locally as to the expectations entertained regarding the new arrangements. Sir John Turney, who is Chairman of the Nottingham Electricity Committee, and himself a practical engineer, confessed at last week's meeting of the Council, when the annual report of the Committee was brought under review, that if the undertaking had had at an earlier period the advantage of the present good management they might have had the vertical system (which he had long since seen successfully in operation in Germany) established in Nottingham three years ago.

Alderman Ball, the Chairman of the Gas Committee, who has lately returned from an extended Continental tour, in company with Mr. Wilkinson, with whom he had the opportunity of inspecting some of the latest developments in regard to gas manufacturing appliances, confessed that in Nottingham, as elsewhere in the country, they had been somewhat lagging behind their Continental friends as to the appliances in use. In Germany particularly, hundreds of thousands of pounds had been expended upon the installation of the most modern appliances. In England, he thought they had contented themselves with sticking too long to old principles. But this policy found no favour with the Nottingham Committee, who were determined that their works should be made among the best in the country. Meanwhile, information as to the practical results attending the new installation at Radford will be awaited with interest. But, from the circumstances indicated, many months must necessarily yet elapse before the data are available.

Gas Employees and Trade Union Tyranny.

Evidence has not been wanting of late that in their methods of trade union propaganda there is a disposition on the part of those responsible for matters of organization in connection with the Nottingham Corporation gas workers to proceed to lengths which cannot be said to err on the side of moderation. In relation to the attempt to get all the employees within the fold, a very active campaign has been waged; and so long as the agitation has been fostered by tolerant methods, the Gas Committee have in no way interfered. But an incident has now arisen which reveals trade union methods in their most undesirable aspect, and has led to a firm stand being taken which is not without its interest, apart from the local considerations involved. An attempt has been made to dragoon the Committee into dispensing with the services of one of the employees engaged in the meter-repairing department of the works, because, in defiance of the official dictum, he has dared to remain aloof from the organized ranks. The agitators had the temerity to make it a test case of "downing tools" if the so-called blackleg were allowed to remain. But the Committee showed that they were in no way affected by this cheap bombast; the result being that the "enemy

of organized labour" has been retained in a place for which his qualifications as an artisan fit him, while the others now find themselves on the wrong side of the door.

The case is typical of modern-day agitators and their methods; the Council being asked, at their last meeting, by one of the rapidly dwindling band of Socialistic representatives who now find seats in the Chamber, to express their condemnation of the alleged high-handed action of the Committee, of which Alderman Ball is Chairman. But that gentleman had little difficulty in pricking the bubble—he taking a strong view of the obligation resting upon the Corporation to protect the employees. Neatly negativing the special pleading for which Mr. Bowles, the Socialist member referred to, had been responsible, he not unreasonably twitted that gentleman with playing to the gallery. The charge had been that the Gas Committee had treated a section of their men unfairly by practically locking them out. Alderman Ball, while admitting that there had been an unfortunate dispute between the Committee and a section of the men representing the tinplate workers, quickly shattered the misconception which it had been attempted to raise. The fact was, he explained, that there were thirteen men working in the meter-repairing shops who belonged to the Tinplate and Metal Workers Association. There was another man, an efficient artisan, who had been in their employ fourteen years, and about whom there was no complaint whatever to be made. The Society, through their principal Secretary, agreed some two years ago that their members should be allowed to work with this one non-Society hand; but, for some unaccountable reason, it had now been determined that they were not to work any longer with him. Although the man was capable of doing his work, the Committee were asked to turn him adrift for the simple reason that he would not join the trade society. But they unanimously decided to refuse to discharge him.

In illustration of the solicitude of the Committee to deal with the case upon equitable lines, Alderman Ball explained that charges having also been made against the foreman of the works, and the foreman having made certain allegations against the Secretary, a meeting was arranged, at which the Committee agreed to see also the President and Secretary of the Nottingham Trades Council, together with the Local Secretary of the Chief Metal Workers Association; but they decided not to have the General Secretary of the Society, because their foreman had complaints to make. Hence all this trouble had arisen. Without the General Secretary of the Society, the other representatives chosen declined to attend the conference. The result was that he (Alderman Ball) and the Vice-Chairman of the Committee were left waiting; their morning being wasted, and no further progress effected in the matter. They were desirous of doing just what was fair and right with the Society, of working to their rules and of encouraging Union hands before others; but emphatically they declined to stop the man in question. They confidently left it to the Council to say whether, under the circumstances which he had related, they considered the Gas Committee had acted rightly or not. There was no mistaking the pronounced feeling of the general body of members; and the attempt to sow dissension in the Council failed miserably.

The men, in a position of enforced idleness, appear to be now more chagrined almost at the refusal of the Committee to see their General Secretary than at the original cause of the trouble. That gentleman—Mr. J. C. Gordon—had travelled down from London for the purpose of the interview; but, not unnaturally, Alderman Ball and the Vice-Chairman deemed as sufficient the presence of Mr. Bell, the President, and Mr. Thundercliffe, the Secretary of the Nottingham and District Trade Council, who, being upon the spot, may be regarded as knowing the whole of the facts. Their attitude in the matter, moreover, was strengthened by the ill-concealed evidence of certain strained relations between the foreman of the works and the Union Secretary. Having been allowed a reasonable time upon which to confer upon the situation, the men found, upon their far too belated return to the works, that the Committee had also a mind of their own, and, not brooking dictation, had given directions which resulted in operations being stopped. Typical of trade union methods, the trouble has not been allowed to rest here. The tin-workers employed by the Gas Committee were relieved of their responsibilities about two months ago; and, in the interval, no effort has been lost to stir up enmity in other quarters, with the result that a still larger number of hands employed by two private meter manufacturing firms in the city have struck within the last few days, in sympathy with the Corporation ex-employees—the ostensible cause being that those two firms (one being the Metropolitan) were, by the terms of their contracts, asked to undertake repairing work for the Corporation, which the men refused to do. Meanwhile, the sinews of war with which to prolong the struggle have been forthcoming from trade union sources, and the men have assembled almost daily in the neighbourhood of the Woodborough Road repairing shops. The dispute now threatening to assume more formidable proportions, and possibly to bring within its train other of the Corporation workmen, a meeting for the consideration of the situation was held on Saturday afternoon at the People's Hall.

BRADFORD BUDGET STATEMENT.

The Gas Undertaking.

The budget statement which was presented at last Tuesday's meeting of the Bradford City Council showed that there was to be an advance of 6d. in the pound in the rates; but it was urged that the city could to-day better afford a rate of 9s. in the pound than it could afford the 6s. 6d. at which the rate stood in 1901.

Mr. JAMES HILL, the Chairman of the Finance and General Purposes Committee, in the course of a lengthy statement dealing with money matters, said the estimates now before the Council were providing no less a sum than £9747 for capital expenditure incurred in excess of borrowing powers, or for which powers had not been obtained; and he urged on every committee the necessity of seeing that expenditure was kept within the limits of the borrowing powers. The standard of workmen's wages generally was being raised; and the Council had not been slow to set an example in the treatment of their employees. During the twelve months, advances in wages had been granted representing over £16,000 a year. He did not believe there was a municipality in the kingdom with undertakings in a sounder financial condition than those of Bradford, and that this was appreciated in financial circles was evidenced by the fact that within the past year they had been able to borrow, or re-borrow, without any difficulty, and at rates much less than many of their neighbours, no less than £1,500,000. The Committees had exceeded by £19,262 the amount of their last year's estimates; and this sum would have to be raised in the coming year. The total to be raised was £608,678, or an increase compared with last year of £59,386. Last year there was appropriated from trading undertakings £33,200; and he recommended the appropriation this year of £39,200. The amount to be raised by rates was £569,478, or £53,386 in excess of the sum raised last year. Towards this increase of £53,386, the same rates as last year would produce more—in consequence of better collection and increased rateable value—by £17,442, leaving £35,944 to be raised by increased rates. This required an additional 6d. in the pound—2d. on the city rate and 4d. on the general district rate. The £39,200 proposed to be appropriated from profits in relief of the rates was made up as follows: Tramways undertaking, £17,200; water, £8000; gas, £5000; electricity, £5000; markets, £4000. The income for the past year from the sale of water had decreased by about £2500, owing mainly to industrial disputes and to the fact that a number of consumers had obtained a private supply since the drought of 1911. The effect of the concessions recently made to water consumers would be to reduce the income by some £6000 a year; and with an increasing amount required annually for interest and sinking fund the profit would be considerably reduced in future years. The gas undertaking had had another good year, thanks largely to the increased demand for residuals. With regard to the electricity undertaking, he remarked that there had been a considerable expansion in the number of consumers during the year, and there was every indication that the growth would continue. The policy of reducing the price charged to large consumers had already had the effect of increasing the profit to the Corporation. A narrow margin of profit, multiplied by a large output, was more satisfactory to everybody concerned than the stifling of demand by charging heavier prices. He again recommended the Gas Committee to consider the question of charges for large steady loads and for gas used for heating and cooking purposes; for he believed the solution of the problem of town smoke rested largely with the Gas and Electricity Committees.

The motion for the adoption of the budget having been formally seconded, some considerable amount of discussion ensued, in the course of which

Mr. S. DEIGHTON remarked that the most alarming feature of the statement was the figure given by which the Committees had overspent the estimates. Seeing that the estimates were for so short a period as twelve months, every effort should be made by Committees to keep within them. He felt he must make a personal protest against the appropriation of £5000 from the balance of the Gas Department. For eleven years the profits of the department averaged only £2786 annually. The year just closed would yield a larger figure; but it would be less than £4000; and the Council must bear in mind that this was due to a phenomenal yield from tar, coke, and other residuals. As to the liabilities which the Committee would have in the immediate future, he would point out that next year they were face to face with £20,000 extra expense—£10,000 being due to the advance of the price of coal.

Mr. E. J. SMITH said that Mr. Deighton's black picture of the Gas Department was misleading. If the department stood upon its own merits, it would show a much larger profit than appeared on the surface. But it had to bear the burden of many gas-works taken in with added areas, and the amount of the burden would be equivalent to the extras to which Mr. Deighton had called attention. It was a significant fact that the trading concerns which were so liable to the criticism of ratepayers outside were after all proving the salvation of the ratepayers; and he could not help thinking that the Council should keep an open mind on the question of extending enterprise in this direction.

The resolution was carried.

DUKINFIELD GAS DEPARTMENT.

The Past Year's Working.

The Gas Manager of the Dukinfield Corporation (Mr. William Lindley) has issued his report on the working of the gas undertaking in the twelve months ended the 31st of March, together with the accounts. The gas-rental amounted to £10,700; a sum of £2702 was received for coke, £996 for tar, and £697 for ammoniacal liquor; and the total receipts were £15,149. The expenditure amounted to £10,358 (£5302 being for coal, £1153 for wages, and £877 for rents, rates, and taxes); leaving a balance of £4791. By the addition of cottage rents and bank interest, this was brought up to £4848, which was disposed of as follows: Twelve months' annuities, £1077; interest on loans, £973; and sinking fund, £1039—leaving a profit of £1759. There was a balance of £4134 on the profit and loss account on March 31, 1912; and the addition of the profit for 1912-13 made a total of £5233. Since 1908, there has been an increase in the net profits from £552 to £1759.

Mr. Lindley says the carbonizing plant worked satisfactorily during the year; the yield of gas per ton of coal being 12,173 cubic feet, compared with 11,981 cubic feet the preceding twelve months. The sale of gas amounted to 92,274,500 cubic feet (an increase of 3 millions) apportioned as follows: Cottages, by ordinary meters, 41,172,300 cubic feet; ditto slot meters, 15,087,600 cubic feet; mills, 27,713,100 cubic feet; public lamps, 7,086,700 cubic feet; and gas offices, works, &c., 1,214,800 cubic feet. The total make of gas being 100,271,000 cubic feet, there were unaccounted for 7,996,500 cubic feet, or 7·97 per cent. The quantity of coal and cannel carbonized during the year was 8237 tons; and of the 12,173 cubic feet of gas per ton made, 11,202 cubic feet were sold.

THE HOT-WATER CAMPAIGN.

By "F.W.G."

[From the "Bulletin" of the British Commercial Gas Association.]

Several facts have already been made very clear by the spring campaign of advertising gas for water-heating, which the Association has been and is carrying out.

The first is that there is a great latent business in water-heating by gas that only needs cultivating upon sound lines to bring a rich harvest to the industry, for the interest displayed by the public in the advertisements is unmistakable and very wide-spread. A great demand for gas water-heaters can be created—is being created.

Creating a Demand.

That is a point in regard to advertising which many business men of the old school have not yet realized. Business does not consist merely in satisfying an existing demand. To be truly progressive, a business manager must be always using his powers of observation and imagination to realize the possibilities of creating demand, and his powers of invention and organization in providing the means for supplying it. Now before a demand for any particular article can exist, the public must be aware of its existence. That is where advertising becomes essential.

A demand for a means of heating water other than by the kitchen fire has existed ever since the gas-cooker won its way into the kitchen. The geyser has partially, and, within its limits, very successfully, supplied the need, and will continue to play a very useful part in the campaign for "no-coal kitchens." But there are very many cases where the geyser is not a sufficient substitute for the coal-range boiler. The manufacturers, realizing this fact, have designed and brought to a considerable degree of efficiency gas-heated boilers of various types, which satisfactorily meet the demand for an alternative to the coal-range boiler.

Success Awaiting Enterprise.

But the demand for these boilers has only just begun to grow, because the public have only just begun to know of their existence and possibilities. The Association's campaign is steadily increasing the demand by spreading the knowledge of the fact that such appliances are available at reasonable cost. The campaign has made it clear, by the deluge of inquiries—by post, by telephone, and by calls—that has embarrassed the staff by its magnitude for several weeks, that a great demand for gas water-heaters can be created by persistent publicity.

Another fact that has been made evident by the correspondence and by the conversations held with callers who have, many of them, come long distances by train, is that a great many gas managers are either ignorant of, or indifferent to, the possibilities of increased business that lie in this demand for water-heating apparatus, or do not possess the requisite staff for dealing with it. The cry of the public constantly is: "I can get no satisfactory information from my company"—or "from the show-rooms in my district;" and this applies not only to visitors from quiet country towns, but to not a few from the districts of companies reputed to be progressive.

Judging by some of the evidence, it would seem as if some managers even resent having business created for them—whether because it involves the trouble of supplying the demand or because they think it a reflection upon their own enterprise, it is not easy to say, or to imagine. However that may be, the fact stands out clearly that the industry has not yet awakened in all quarters to the possibility of the increased business that is waiting to be secured by the enterprising manager.

The Need for Men Educated for the Work.

Another fact that becomes obvious is that there will be a steadily growing demand by gas undertakings for officers capable of advising consumers upon the apparatus that will best fulfil their particular requirements—no simple task—and for fitters capable of installing hot-water apparatus in a satisfactory and economical manner. The need for specialized education of both staff and workmen grows apace. Is the industry alive to the necessity?

How the Association can Help.

To do their part in the education of staff and men in the branch of hot-water supply by gas, the Committee are arranging for a series of articles dealing with the subject on general lines, not in regard to any particular make or makes of apparatus, to appear in the "Bulletin" in the immediate future. As complementary to these articles, notes by any of our readers on difficulties they have encountered, and how they have overcome them, in connection with hot-water work, will be welcomed, as will also questions respecting difficulties encountered and not overcome. Every effort will be made in such cases to assist correspondents in getting through their troubles.

How the Association is Helping.

Finally, the campaign has made it clear that advertising in daily papers of vast circulation (and weekly papers of very wide-spread circulation among the money-spending classes), in which no individual undertaking can afford to maintain a scheme of publicity, is of enormous value in creating a new demand on the part of the gas-consuming public. Consumers who pay little or no attention to the advertisements of their own gas undertaking, be they never so well drawn and persistently displayed, are attracted and persuaded by advertisements from an "outside" party, which they rightly think is not interested (as the consumer often imagines every gas company is interested) in recommending gas appliances designed to consume inordinate quantities of gas.

It may not be flattering to the gas manager, but it is nevertheless the fact, that many consumers distrust the advice given them in the show-rooms even of the best-reputed undertakings. Those who doubt this should spend a week in the Secretary's room at 47, Victoria Street.

Who Reaps the Greatest Profit?

The hot-water campaign, then, is creating a great opportunity for every gas undertaking in the country, subscribing and non-subscribing alike (the latter, happily, are growing small by degrees and beautifully less). Those who are profiting, and will profit, most by its operations, are those who have done, and are doing, most (1) to educate the public in their own districts by local publicity work, in which the Association can help them enormously, (2) to educate their officers so that they can advise the public aright, and (3) to train their men so that they can do credit to the industry and give satisfaction to the public by their installation work. The whole question is one that presses for full and thoughtful consideration by every one who desires to maintain or swell his percentage of increase in gas sold.

THE GERMAN SULPHATE OF AMMONIA AND BENZOL ASSOCIATIONS.

In the "Iron and Coal Trades Review" for May 9, there appeared the annual reports of the German Sulphate of Ammonia and Benzol Associations; and we reproduce them below.

Sulphate of Ammonia Association.

According to the annual report of the Deutsche Ammoniak Verkaufs Vereinigung, of Bochum, sulphate of ammonia was a favourable market in 1912, although offers exceeded demand in the second half, and caused the upward movement in prices which took place in the second quarter not only to come to a standstill, but also to slowly give way to a decline. During the spring there was a scarcity, which was materially accentuated by the strikes both in England and Germany. As a consequence, the English daily quotations experienced an upward movement. A sudden change was manifested in August and September in consequence of the extraordinarily unfavourable conditions of the weather, which caused delays in the placing of autumn orders, and to some extent entirely stopped them. The result was that a surplus of disposable ammonia, particularly abroad, arose. Even the constant rise in the prices of nitrate was unable to arrest the weakening. Through its propaganda in the home market, the Association was able to withdraw from the foreign market in face of yielding prices, and thus contribute towards a strengthening of the market conditions.

The deliveries effected for the account of the Association amounted to 315,386 tons in 1912, as compared with 291,004 tons in 1911. Of the former, 309,947 tons represented the production of constituents of the Association, as contrasted with 283,011 tons in the previous year; while the balance was formed of tonnage sold for the account of the Upper Silesian Coke and Chemical Works, the Comptoir Belge du Sulfate d'Ammoniaque, of Brussels, and M. E. Coppée, of Brussels. The share of the inland market in the turnover of the constituent works only was 242,799 tons in 1912, as against 208,643 tons in 1911, and that of the export trade was 67,148 tons and 74,368 tons in the two years respectively. According to the statistics collected by the Association, the total consumption of sulphate of ammonia in Germany in 1912 reached 425,000 tons, as compared with 370,000 tons in 1911—thus showing an increase of 55,000 tons. The external markets with which the Association was concerned were Holland, Switzerland, Belgium, France, Italy, Spain, the United States, Java, and Egypt, together with the German Colonies. The deliveries of concentrated liquor amounted to 5964 tons, as against 4602 tons in 1911.

The imports of nitrate into Germany, after deducting re-exports, totalled 787,467 tons, as contrasted with 703,002 tons in 1911. If it is assumed that one-third of this quantity was used for industrial purposes, the consumption for agricultural uses amounted to 523,645 tons, as against 468,668 tons in 1911. This compares with a consumption of 425,000 tons of sulphate of ammonia, as contrasted with 370,000 tons in the preceding year. The imports of sulphate of ammonia into Germany in 1912 amounted to 23,098 tons, as against 24,463 tons in 1911; and 17,861 tons of the former were derived from Austria-Hungary, 1884 tons from Great Britain, and 2325 tons from Denmark. The total production of sulphate by the countries with which the business of the Association is concerned was as follows in the past two years:—

Country.	1912. Tons.		1911. Tons.
Germany	492,000	..	418,000
Great Britain	379,000	..	378,500
United States	151,000	..	115,000
France	69,000	..	60,000
Belgium	50,000	..	40,000
Italy	15,000	..	—
Austria-Hungary, Russia, Spain, Denmark, Holland, &c.	175,000	..	169,500
Total	1,331,000	..	1,181,000

The Association undertook the sale of sulphate of ammonia also in 1912 for a number of companies and gas-works.

Benzol Association.

The annual report of the Deutsche Benzol Vereinigung, of Bochum, states that further progress in the benzol industry took place in 1912. While in former years the domestic customers for benzol were chiefly the large dye-works, and subsequently the small industries for the supply of stationary motors with fuel, the employment of benzol for motor cars occupied constantly increasing attention during the past year. The production of 90 per cent. commercial benzol was scarcely sufficient for the requirements, owing to the development of the business, especially as the trade suffered from considerable interruptions in working in consequence of the strikes and other factors causing a decline in the output of the constituent works. It was only possible to fulfil contracts satisfactorily about the end of the year, when conditions of working had again become normal.

The great scarcity of liquid fuel caused the English quotations for 90 per cent. benzol to advance in January; but after various fluctuations in the course of the year, prices receded to their former level as soon as the Association was tolerably able to meet the current requirements. Deliveries effected by the Association comprised 30,870 tons

to dye-works, as compared with 23,273 tons for 1911; 16,714 tons to other countries, as against 19,805 tons; and 36,876 tons to small industries, as contrasted with 23,323 tons in 1911. It will be observed that the turnover totalled 84,460 tons, and showed an increase of 18,059 tons over that of 66,401 tons in 1911. The increase in the requirements of the dye-works was only apparent, as the Association entered into contracts with the former which were formerly carried out by outside producers. As the average allotments of the constituents reached a total of 112,340 tons, the deliveries represented an average activity of 75 per cent. The actual allotments at the beginning of 1912 were 103,200 tons; and they rose to 126,000 tons by the end of the year, as a result of increased capacity and the accession of new members.

The market for toluol, solvent naphtha, and xylol was equally favourable with that for 90 per cent. benzol. During the whole of the year, the Association was employed according to the production; and this result was achieved to a large extent owing to its being possible to dispose of a large portion of the output of solvent naphtha for motor cars. The turnover amounted to 9237 tons of toluol (crude), as contrasted with 6011 tons in 1911; and 12,274 tons of xylol solvent naphtha, as against 7308 tons in 1911. These figures show that the deliveries of the former represented 61 per cent. of the productive capacity, and those of the latter 50 per cent.; these comparing with 48 per cent. and 36 per cent. respectively in 1911.

THE FUTURE OF BRITISH FUEL.

Benzol Utilization—Low Temperature Carbonization.

In the last number of the "JOURNAL" (p. 383), we reproduced, from an article on "The Future of British Fuel" in the Engineering Supplement of "The Times," some remarks on the utilization of benzol as fuel. The supplement last Wednesday contained three letters on the general subject.

Taking first the question of the utilization of benzol, Mr. Stenson Cooke, the Secretary of the Petrol Substitutes Committee, wrote:

This Committee (consisting of representatives of the chief motoring organizations) has been formed, in consequence of the recent large and maintained increases in the price of petrol, for the purpose of investigating and encouraging the production of alternative fuels, preferably home produced, such as benzol. I think it can be clearly demonstrated that the introduction, or extension, of benzol recovery plants will be greatly to the advantage of the coal industry, irrespective of the benefit it must undoubtedly be to the community at large; and I hope that the article may have the effect of interesting colliery owners in the question. The high price of petrol has had the effect of directing the attention of users of motor vehicles to the value of benzol as a substitute for petrol. The investigations of my Committee show that there is a steady and certain market for benzol at a remunerative price; and there is no reason to doubt that the demand would still be maintained, even if the present output was doubled.

Sir Henry Cunynghame offered the following remarks:

The author of the article points out that each ton of coal is capable of yielding, in addition to three-fifths of a ton of semi-coke, 3 gallons of motor spirit, 1 gallon of naphtha, 2 gallons of heavy fuel oil, 80 lbs. of pitch, and 20 lbs. of sulphate of ammonia. Suppose that only half our land usage of coal were semi-coked—that is 70 millions of tons—this would give us 200 million gallons of motor spirit (double our present consumption), 2 million tons of pitch, which we could put on the roads if there were not a thousand other uses for it, half-a-million tons of sulphate of ammonia for manure, and 40 million tons of semi-coke for smokeless heating. The object of my letter is to ask for further details of the relative heating power of coal and coke, and of the general aspect of the finance of the scheme. Such a change must be gradual. Our boilers could not be suddenly scrapped. It would be too much to ask our ladies all at once to give up their cheerful fires (which make the household coal bill three times as big as it might be). Nor can we expect cooks to forego the pleasure of burning 100 lbs. of coal daily in a kitchen range when 10 lbs. would do.

The subject of low-temperature carbonization was dealt with by a correspondent who signed his letter "One Interested." He has studied the problem for some years, and he wrote as follows.

No householder tolerates smoky chimneys and discoloured walls in his house, and most of us have an eye on the economical use of the contents of our coal-cellar. But the nation as a whole has neglected the principles that are observed by the individual. Towns are to the nation what rooms are to the individual, and the country is the national pleasure or kitchen garden. To a large extent both are fouled, while the national coal-cellar is depleted by our present want of system.

To one who has spent his life abroad, it is astounding to find so little attention paid to this matter by the "man in the street," and so much to political wrangles and "*tu quoques*." It is probable, however, that a change is taking place. The increasing use of motor-bicycles, cycles, and motor-cars is teaching metallurgy, engineering, and chemistry to the new generation in a way that technical schools have failed to teach the present one; and the time has come for the propagation of a gospel of clear skies, clean towns and suburbs, and economy of the nation's fuel-store.

If these arguments have force in London, they have still greater force in the great smoky towns of the Midlands and North. The manufacturer of to-day is more careful of emitting smoke than of old; but the workman, who has more money to spend than of old, seems to be more prodigal of fuel in his kitchen. Anyone standing on one of the grand Lancashire or Yorkshire moors in the manufacturing districts on a clear winter evening will see every valley filling up with coal smoke at 5 p.m., the production of thousands of kitchen fires lighted to

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Because of its unique internal construction, which secures Absolute Accessibility.

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cook the evening meal of the returning workers. The thought of these thousands of warm, comfortable homes may add to the beauty of the evening; but how much the better for the toiler in the valley and the observer on the hill if the same result could be achieved at a less ruinous cost, as it undoubtedly could be if the aims of the writer of the article are achieved.

That the problem will be solved is probable; and England, where the gain will be the greatest, is the place where the solution is most likely to be effected. Once effected, however, the country which possesses poor coal will reap as great a benefit, for its national fuel supply will be lifted into a higher grade. The inferior coal of India, for instance, which exists in enormous quantities, will make excellent gas and tar oils; and the demand for the "smokeless semi coke" for domestic purposes will be limited only by the supply and by the facilities for distribution.

At Indian collieries, it is a common thing to see inferior bands, or even roof-stone with coal adhering thereto, being carbonized in heaps, from which after the fire is extinguished cinders are picked and despatched for domestic consumption under the name of "poora koila," or "burnt coal." The native does not like to cook on coal fires, as the smoke taints his food. Where he gets coal without paying, as he does at the collieries, where each coal-getter is allowed to carry out a basket of coal from the workings when he goes home, or at railway and export depôts, where he steals it, he carbonizes it first in the open, and when the glowing cinders cease to smoke he cooks his food upon them. It is evident, then, that if he can get "poora koila," or, as the writer calls it, "smokeless semi-coke," at a sufficiently low cost, he is prepared to use it instead of wood, charcoal, and cow-dung, which are scarce in the big towns, and every year more difficult to procure even in the country.

As being, in some measure, connected with subjects dealt with in the preceding correspondence, it may be of interest to reproduce the following letter by Principal Graham, Chairman of the Smoke Abatement League, which appeared in the "Manchester Guardian" on Monday last week. It was written in support of a suggestion made by a correspondent that the Corporation should manufacture smokeless fuel at the gas-works.

The public case for it [the proposal] is overwhelming. Gas fires and cookers are doing much, and will do more; but the complete cure of domestic smoke will not be achieved, so far as our present knowledge goes, except by using a fuel from which the smoky elements have been withdrawn in the form of useful gas, sulphate of ammonia, and tar. Every thoughtful person knows that the removal of this domestic half—the more obstinate half—of the smoke problem would mean a gain in money and in health and happiness well worth some small lack of profit on the manufacture.

But there need be no lack of profit. Professor Vivian B. Lewes, in his recent standard book on the "Carbonization of Coal," preaches the importance and practicability of the manufacture of smokeless fuel all through. He gives the following table of costs. "High temperature" distillation of coal is the present system, in which as much gas as possible is obtained, and hard coke without inflammable matter is left. The "low temperature" makes the proposed smokeless fuel, in which about half of the inflammable materials are retained for use in the fire-grate.

COMPARISON OF THE COST OF 1000 CUBIC FEET OF GAS.

High Temperature.	d.	*Low Temperature.*	d.
Coal at 11s. 6d., 2 cwt. . .	13·30	Coal at 11s. 6d., 4 cwt. . .	26·50
Purification	0·50	Purification	0·50
Salaries	0·54	Salaries	0·54
Wages	2·25	Wages	2·25
Maintenance	3·45	Maintenance	2·21
	20 04		32·00
Residuals—		Residuals—	
Coke, 0·82 cwt., at 12s. 3d.	6·11	Coke, 2·4 cwt., at 12s. 3d.	17·64
Tar, 0·9 gall., at 1·5d. . .	1·30	Tar, 4·6 gall., at 1·5d. . .	6·90
Ammonia	2·11	Ammonia	2·80
	9·52		27·34
Net cost of 1000 cubic feet of 14 c.p. gas in holder . .	10·52	Net cost of 1000 cubic feet of 20 c.p. gas in holder . .	4·66
Calorific value, B.Th.U. .	592	Calorific value, B.Th.U.. .	750
Sulphur per 100 cubic feet, grains.	45	Sulphur per 100 cubic feet, grains.	18

In this estimate, it is assumed that low-temperature coke and tar will be sold as cheaply as the high-temperature articles, which is wholly improbable. They are much more valuable. It is proposed here to sell the smokeless fuel at 12s. 3d. per ton, and yet to make 20-candle gas at less than half the present cost of 14-candle gas.

There is no mystery or difficulty about the manufacture. The gas engineers all declare that it is quite easy, and that they could do it if they were told; but they will not do it unless they are definitely told to do so. Gas engineers, like some more pretentious professions, are extremely conservative, and are very happy in their present process, of which they are justly proud, and in which their sole concern is to get out as much gas as possible. I have, however, appealed in vain to the organs of the industry and to an assembled gathering of gas engineers to give me any reason beyond that of the natural conservatism of frail humanity why this process should not be widely carried on. They have, it is true, stated that there would be no demand; but this is, in my opinion, a mistake. A very considerable trade was done in Manchester in coalite at 27s. a ton—a poorer product than can now be made, at a purely fancy price. It had to be brought from near Birmingham, and the process of its manufacture was still imperfect at the time. I used coalite myself in sixty fire-places for half a year, and we found that it was 50 per cent. dearer at that price than coal. There are at least two processes now on the market which are better than that was;

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The Cookers comprised in our new 30-40 series are a revelation in value. They embody features which are usually only to be found in the most costly cookers, such as—to deal with the hotplate only—the following:—

Lifting Cornice (fixed if required) Wrought-Iron Bars which do not fall out when cornice is raised. Double reversible grill, which when reversed gives an absolutely vertical flame for boiling. All burners removable and interchangeable and fitted with gas and air adjusters. The cornice itself is roomy and of handsome appearance.

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SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

and there seems no reason to doubt that at 20s. a ton there would be a large demand for the article. Our experience would point to selling it at 18s. per ton. But coal has risen in price since then; and probably at 1s. per hundredweight it would compete with coal, without counting all the advantages of cleanliness which would be added.

But one need not dogmatize about the exact price. If the above figures are anywhere near correct, the price could be easily adjusted to the demand. Nor need the production be begun on a vast scale. The plant might grow as demand arose. Our city is among the "good" cities in regard to smoke abatement; but we are surrounded by "bad" neighbours. It is evident, however, that until the Corporation are willing to make this product the city is omitting to tackle its dirty atmosphere in a really businesslike way, and does not deserve to be called "good." The Bill which Mr. Gordon Harvey, on behalf of the Smoke Abatement League, has just introduced to the House of Commons [noticed elsewhere] will provide for the establishment of larger areas of local government for smoke abatement purposes than we have at present, and may help us in dealing with the negligent districts around.

LEWISHAM GUARDIANS AND THE LIGHTING QUESTION.

At a Meeting of the Lewisham Board of Guardians on Monday last week, the question of lighting the workhouse by electricity again came up, on the recommendation of the Works Committee that the tender of Messrs. Haycraft and Son, Limited, of Blackheath, should be accepted for installing the necessary electrical fittings, at a cost of £759. The matter had been adjourned from the previous meeting to enable the Committee to communicate with Messrs. Tredegar, of Victoria Street, who were the next lowest tenderers to Messrs. Weston, and had been offered the contract, but had declined it on the ground that in making their quotation they had been misled by the specifications. Messrs. Tredegar now stated that they tendered with a view of the contract for the installation at the workhouse and the infirmary being given to one firm. If the work was separated, they would have to add 5 per cent. to the original amount for the workhouse contract. It was pointed out by certain members of the Board that the tender would then be £50 less than that of Messrs. Haycraft; but others argued that it would not be in accordance with the policy of public bodies to allow one firm to alter their figures after the amount of all the tenders had been disclosed. On a division, it was agreed by a large majority to accept Messrs. Haycraft's tender.

The Chairman (Mr. Jackson) said that at the last meeting he called attention to a statement which had been supplied showing the comparative cost of lighting by gas and electricity in a local church, which was largely in favour of electricity from an economical standpoint, He had since made inquiries, and was told that the system of gas lighting which had been in vogue at the church was an old one, with flat-flame burners; and therefore, under the circumstances, the figures he quoted actually proved nothing. Mr. Richbell asked if the figures were supplied by an officer of the Board; and the Chairman replied that they were not. Mr. Richbell said he believed the last test which was applied in the case at present under notice was distinctly in favour of gas.

THE LIGHTING ARRANGEMENTS AT WEST BROMWICH.

Why the Change from Electricity to Gas was Made.

At the Meeting of the West Bromwich Town Council last Wednesday, the reasons were given for the Highway Committee's recommendation of the change of the lighting of High Street from electricity to gas.

In moving the adoption of the report, Alderman Turley stated that when the Highway Committee recommended the removal of the centre poles, they held out hope that a re-arrangement of the lighting might save a considerable sum towards the outlay. Since then they had had experiments made with electricity and with high-pressure gas. These experiments had not only been going on for the benefit of the Committee, but for that of the other members of the Council and the town generally. The Committee had come to the conclusion that the high-pressure gas was the best, both from an economical standpoint and for the service for which it was intended. The old system of lighting the main thoroughfare by electricity cost the Highway Committee £690 per annum. The Electricity Department had put two schemes before them. One was to retain the existing arc lamps on alternate poles on each side of the street—the price to be reduced from £7 10s. to £5 per lamp per annum with the same light, and after they were switched off at 11.30 p.m. to give four times more light than at present by placing two 50-candle power lamps on every pole on both sides of the street. The total cost of that scheme would be £400 per annum. As an alternative scheme, the Electricity Committee were prepared to place on every pole a suitable fitting containing three 100-candle power lamps, two lamps in every fitting to be switched off at 11.30 p.m., and one 100-candle lamp to remain on every pole from the time named till dawn. The cost would be £450 per annum. The suggestion of the Gas Engineer (Mr. Harold E. Copp) was to instal a 900-candle high-pressure lamp on each alternate pole up to 11.30 p.m., and reduce the pressure after this hour. The Gas Committee were prepared to guarantee a minimum efficiency of 900 candles up to 11.30 p.m., and a minimum of 400-candle power until dawn; the price being £4 per lamp, or £380 per annum. They believed the introduction of high-pressure gas would be the best for the town. They thanked the two engineers for the way in which they had helped them in the matter. The Committee's recommendation was approved.

Another Champion of the Calefactor.

A Consumer's Testimony.

J. W. Champion, Esq., 14, Elmsleigh Park, Paignton, writing on April 25th, 1913, to the Paignton Gas Company, says:—

"With reference to the Calefactor which you fixed for me in December last, I have much pleasure in stating that it gives us every satisfaction, and quite fulfils the conditions required, and the consumption of gas is less than I anticipated. I can thoroughly recommend the Calefactor as an addition to the ordinary range in providing hot water, or by itself, if the range fire is not in use."

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WORKINGTON CORPORATION GAS UNDERTAKING.

Reports and Accounts for the Past Year.

The Gas Engineer and Manager of the Workington Corporation (Mr. E. George Hutchinson) has presented his fourth annual report, embracing the year ended the 31st of March. He states that the quantity of coal carbonized was 9938 tons, and the make of gas 114,775,000 cubic feet, or 4·47 per cent. more than in 1911-12. The quantity sold through ordinary meters was 63,440,400 cubic feet, and through prepayment meters 30,325,700 cubic feet—together, 93,766,100 cubic feet. The gas accounted for was 106,299,300 cubic feet, or 92·62 per cent. of the make. The residuals produced per ton of coal carbonized were: Coke and breeze, 13·5 cwt.; tar, 11·93 gallons; sulphate of ammonia, 22·59 lbs.

The report of the Borough Treasurer (Mr. John Noble) for the past financial year, which follows that of Mr. Hutchinson, shows that the gross profit was £3773, against £3626 in the preceding year; being an increase of £147, notwithstanding a reduction of 1d. per 1000 cubic feet in the price of gas to ordinary consumers. The net profit, after meeting interest, sinking-fund charges, and loan repayments, is £2225, compared with £1905 the preceding year—an increase of £320. In accordance with the instructions of the Council, Mr. Noble transferred £650 to the old district fund. This left a profit of £1575 not appropriated. The net profit is increased by £172, owing to the reduced charges for interest and sinking fund caused by the rapid extinction of the debt upon the gas undertaking.

The two reports came before the Town Council at their monthly meeting last Tuesday, when the Chairman of the Gas Committee (Alderman Hall), in moving the adoption of their report, said they had again beaten all records, notwithstanding three serious drawbacks—the coal strike, two Easter holidays in the financial year, and the abnormal wet summer. Any of these would have been bad enough alone; but combined they constituted a very great handicap. After providing for loans, loan repayments, and sinking fund, there remained a disposable net profit of £2225. The Committee recommended the transference of £650 to the old district fund, and £1000 to the old North Ward, £500 to working capital account, and £75 to the renewals account. These suggestions, he thought, would meet with unanimous approval. In the last ten years they had transferred a total of £8500 to St. Michael's and St. John's Wards' funds, in relief of the rates, and had conferred benefits on the consumers, represented by 6d. per 1000 cubic feet reduction in the price of gas—from 2s. 8d. to 2s. 2d. Nor was this all, for they had cleared off, out of their revenue, a suspense account of more than £4000, and reduced the price of public lighting from 55s. to 40s. per lamp; and, as they had 714 lamps, this was equal to a further saving to the ratepayers' pockets amounting to £535 10s. per annum. The Committee were of opinion that the time had arrived when the consumer should have further consideration; and they recommended that the price of gas within the borough should be reduced as follows: Through ordinary meters, from 2s. 2d. to 2s. per 1000 cubic feet; through slot-meters for lighting, from 2s. 7½d. to 2s. 6d.; through slot-meters with cooker installations, from 3s. 2d. to 3s.; and for gas-engines, from 1s. 10d. to 1s. 9d.—the reductions to come into operation after the reading of meters in the June quarter of this year. The recommendations were unanimously adopted.

GAS DEPARTMENTS AND TENDERS.

Questions of Procedure.

Among the matters discussed at last Wednesday's meeting of the Salford Town Council was the policy of the Gas Committee in negotiating with contractors after their tenders for the supply of coal had been received. Mr. Hampson, a member of the Gas Committee, said he neither assumed nor believed that money was being made by any members of the Corporation. He, however, regarded the practice as immoral, and an injustice to the great body of colliery owners in the country. He desired freer competition, straightforward and open tendering, and justice to everybody. He moved that the minutes of the Gas Committee relating to tenders for the supply of gas coal be modified in order to prohibit negotiations after tenders had been received. Mr. Bescoby seconded, and said that coal dealers put up their prices in order to reduce them when negotiations were entered into. Mr. Willett supported the Gas Committee, and mentioned an instance where negotiations with regard to the purchase of sulphuric acid had led to the saving of £4500. Alderman Phillips (the Chairman of the Gas Committee) said if the Council were prepared to give away public money, they could do it. Experience had shown the efficacy of negotiating, and thousands of pounds had been saved by this means. The policy of the Gas Committee was ratified by 23 votes to 15.

On the same day, Alderman Badlay called the attention of the members of the Leeds City Council to a paragraph in the Gas Committee's minutes recommending that contracts for meters required during the ensuing year should be allocated among certain firms. He said he understood that some firms were given a second opportunity of tendering, and suggested that this provided an opportunity for "manipulating" the offers. Alderman Ford admitted that the principle of allowing second tenders was very bad, and would only tend to lower the character of the Corporation in the eyes of the outside world. Mr. Ratcliffe said there were times and occasions when, in the interest of the city, such a course should be adopted; and this was one of them. The firm who were lower in price than their competitors some years ago, had raised their quotation later. Their aim had been in the first place to "get in." Having got in, they promptly advanced the price. This was not fair to firms who had put in genuine tenders. The contracts, as the Committee proposed to place them now, would be valuable from an experimental point of view, as conditions were different from what they were some time ago. The price of iron had gone up greatly.

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Alderman Badlay moved, and Mr. Gath seconded, the referring back of the minute. Mr. Thaxton, on the other hand, supported the action of the Committee, on the ground that as much work should be kept in Leeds as possible. Alderman Midgley thought there was a very strong case for the matter being referred back. He hoped the Corporation would not begin the practice of allowing local firms to tender a second time. The amendment was defeated and the minutes were adopted.

THE SMOKE ABATEMENT BILL.

The Bill recently introduced by Mr. Gordon Harvey, the member for Rochdale, to prevent nuisances caused by the improper emission of smoke, has been printed. Its provisions are epitomized as follows in a "Memorandum" attached to the Bill.

By clause 1, it is made incumbent upon the owner, occupier, or user of a furnace to have it so constructed that it will consume its own smoke; and the emission of smoke or grit from such furnace or its chimney is constituted a nuisance. At the same time, the Local Government Board are given power to make special exemptions in those cases in which it is impracticable to avoid making smoke in carrying on a business. But this power to exempt is limited to ten years from the passing of the Bill; and an exemption itself must be renewed every two years.

In the second clause, the penalties for offending against the Act are laid down; and the procedure in case of prosecution is indicated.

By clause 3, the Local Government Board are authorized to set up local smoke abatement authorities in those areas in which the local sanitary authorities are failing to carry out their duties with regard to smoke abatement. In London, the County Council is made the local smoke abatement authority.

Under clause 4, local smoke inspectors may be appointed by the local authority, subject to certain requirements as to experience and to the control of the Local Government Board.

By clause 5, the Board are given the right to inspect the records of offences under the Act, in order to see if the local authority are properly carrying out their duties; and, subject to such obligation being satisfied, the Board may pay not more than half the salary of local smoke inspectors by way of a grant-in-aid. Under the same clause, the central authority themselves are required to appoint Government smoke inspectors, and these inspectors are authorized to prosecute in cases where the local authority have failed to do so.

The manner of providing for the expenses of local smoke abatement authorities is dealt with in clause 6, together with a power of allocation by the Local Government Board.

By clause 7, existing powers as to the abatement of smoke nuisances are expressly preserved.

METROPOLITAN WATER BOARD.

Excess Lime Method of Purification—Recent "Pollution" Scare.

At the Meeting of the Metropolitan Water Board last Friday, the Water Examination Committee reported that the Director of Water Examination (Dr. A. C. Houston) had proved from experiments in the laboratory that the addition of lime to impure water rendered that water bacteriologically safe—in other words, the process was capable of destroying all the microbes of epidemic water-borne disease. The experiments did not enable him to express any final opinion as to the practical utility of the process; and the only method of arriving at an adequate conclusion was to conduct a series of outdoor experiments. The Committee stated emphatically that the process should not in any way be regarded as an attempt to obviate the construction of storage reservoirs; but if it could be shown that it would enable storm water to be utilized and rendered safe, which at present, owing to impure conditions, was unsuitable for the Board's purpose, even if passed into storage reservoirs, the double purpose would be served of safeguarding the supply and of increasing the quantity of raw water at the Board's disposal. The Committee asked for £600 for carrying out the experiments; and after some discussion the money was voted.

The same Committee reported on the complaints which had been received of the quality of the water in the western district. It will be remembered that a short time ago the taste and the odour of the water in West and North-West London were found to be objectionable [see *ante*, p. 46]. The Committee reported that the cause of the complaints had been definitely traced to the development of certain species of algæ; and as a result of the steps taken by the Engineer and the Director, the trouble had been entirely overcome.

Water Supply in Belgium.—According to "The Times," an interesting scheme is under consideration for utilizing the water flowing through the valley of the Hoëgne, a tributary of the Vesdre, in the province of Liège for providing a supply to a number of communes in the Verviers and the Herve districts. Preliminary engineering investigations point to the conclusion that the utilization of the waters of this river by means of a dam is commercially possible, and would not necessitate exceptional constructive works or excessive expenditure. During the exceptionally dry year of 1911, the rainfall in the region amounted to a total volume of about 1850 million gallons, of which 44 per cent., it is estimated, flowed into the Hoëgne. It was calculated that during the whole year 1911 about 39½ million gallons would have been available for distribution, and that a dam 70 feet in height would permit the storage of a sufficient volume to meet the expected consumption. The total cost is estimated at about 3,500,000 frs., of which 1,800,000 frs. would be required for the main conduit and 1,050,000 frs. for the distribution system.

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—The quantity of water in the reservoirs has increased by 7,408,000 gallons during the last fortnight, and is about 128 millions higher than at the corresponding date last year. The average daily quantity per head of the population is equal to 47½ gallons. At the meeting of the Trustees held on Thursday, it was arranged that Mr. James Oliver, the Treasurer, in view of the state of his health, should retire, and the Trustees appointed him as Consulting Treasurer, after August, at a salary of £300 per annum. Mr. Charles H. Scally, who has been acting as interim Treasurer, and who has served the Trust for 38 years, was appointed Treasurer, on the understanding that he will give up office on the conclusion of his 66th year. The salary for this appointment is £450 per annum.

The successful students in the "Gas Manufacture" class held at Heriot Watt College were: Andrew Thompson, Dunfermline, certificate and medal; R. M. Simpson, Dunfermline, certificate.

Glasgow.—The result of the examination in the "Gas Manufacture" and "Gas Distribution" classes, held by Mr. Henry O'Connor in the Glasgow Technical College, are as follows: "Gas Manufacture": First-class certificates, James M'Nicol, George Hamilton, Hugh M'Vean, Robert Gibson, George Carr, James Jamieson, Robert Barr. "Gas Distribution": First-class certificates, J. Jamieson, James Dickson, James Bone, Wm. Dolan, John Canning, Angus Carson, Wm. Young, Jas. Beveridge.

Dufftown.—Since the old Gas Company were wound up, about twenty years ago, both public and private lighting has principally been by means of paraffin lamps, although more recently private installations of petrol air gas and acetylene have been put to work in some numbers. The Town Council, who have made up their minds to have an improved scheme of lighting, have obtained expert reports regarding both electric light and coal gas. These have been circulated among the councillors, who have held meetings to discuss them. A meeting of the whole Council is shortly to be held to go into the matter.

Girvan.—Several parcels of shares in the local Gas Company, of the nominal value of £1 each, were put up for auction. The price realized was 30s. per share for the first lot, and 30s. 6d. for other lots.

Greenock.—The plumbers had a conference with their employers on Friday; but they came to no agreement, and consequently struck work on Saturday. The strike has come about owing to the desire for an increase of 1d. per hour on the present rate of wages, which is 9½d., and also on account of certain bye-laws to which they object.

Guardbridge.—The water supply here is to be extended, at a cost of about £1600, by the St. Andrew's District Committee. The Clerk stated the special water supply district rate was 8d., and there was an ample margin to go upon, as they had no drainage or lighting. A Committee were appointed to see the work carried through.

Kirkcaldy.—At a meeting of the Gas Committee of the Kirkcaldy Town Council, the tenders were opened for the supply of coal for the ensuing year, and the contracts fixed showed an increase of 1s. 7d. per ton compared with the previous year, or about 4s. rise in the price since the Corporation took over the undertaking about two years ago. The present year's increase alone is equal to about 3d. per 1000 cubic feet of gas; and there is every prospect of the price to consumers being seriously increased when the estimates are considered.

Leuchars.—Among the joint-stock companies registered in Edinburgh during the present week is the Leuchars Gas Company, Fife, a private concern, with a share capital of £750 in £1 shares.

Pitlochry.—The Special District Committee are being troubled by a leakage of what amounts to practically half their total water supply. The average consumption per head per day appears to be 118 gallons, which is double what might be called an ample allowance; so that there is a total daily leakage of about 100,000 gallons. Tests are being carried out for the purpose of discovering the defects, and a final report is to be delivered.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 9.

Sulphate of Ammonia.

Although the decline in values has not been so great this week as it was last, the tone of the market has remained dull, and prices have continued to have a drooping tendency. Consumers have been somewhat apathetic, and middlemen have evidently not been in a hurry to cover their commitments for May shipment. The closing quotations are £13 3s. 9d. per ton f.o.b. Hull, £13 5s. per ton f.o.b. Liverpool, and £13 7s. 6d. per ton f.o.b. Leith. For future delivery the views of producers and those of buyers have been too divergent to result in much business, and no first-hand transactions have transpired. It is reported, however, that dealers are still offering abroad for July-December shipment at a discount off prompt prices.

Nitrate of Soda.

The market for this article is unchanged, and the values on spot remain at 11s. 3d. per cwt. for ordinary and 11s. 4½d. for refined quality.

LONDON, *May* 9.

Tar Products.

There is no material alteration in markets for tar products, and business is decidedly quiet. Pitch is slightly lower, and orders have been accepted for prompt delivery at these lower prices. Ninety per cent. benzol is fairly firm; and there has been a better demand for both 50's and toluol. Solvent naphtha is quiet; but there is no alteration

THIS IS THE CONNECTION

for use with Metallic Tubing for connecting Grillers, Boiling Burners, &c.

THE SOLARI PATENT CONNECTION.

Indispensable for Flexible Metallic Tubes.

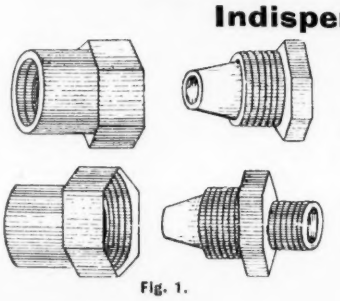

Fig. 1.

This Connection is the most simple and efficient on the market, easy to fix or remove without shortening Tubes or damaging Connection. No soldering required, the Connection being screwed on to the Corrugations of the Flexible Tube.

Fig. 3.

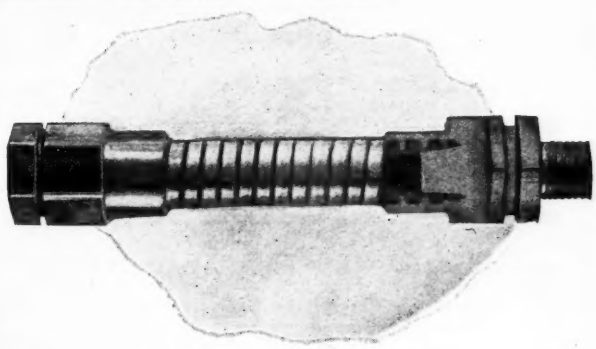

Fig. 2.

Fig. 1.—The Conical Plunger which, being fixed into the Metallic Tube, makes a sound joint.
Fig. 2.—The Plunger in position and its effect.
Fig. 3.—The Flexible Tube complete with Connection screwed, male on one end and female on other.

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in price. Heavy naphthas are quiet. In crude carbolic, though consumers are unwilling to pay the present prices, there appears to be one or two buyers in the neighbourhood of 1s. 5d. for the 60's quality. Creosote is slightly lower for the country makes; but London is fairly firm.

The average values during the week were: Tar, 27s. to 31s. Pitch, London, 45s. to 46s.; east coast, 45s. to 45s. 6d.; west coast, Manchester, 44s. to 45s.; Liverpool, 45s. to 45s. 6d.; Clyde, 45s. to 46s. Benzol, 90 per cent., naked, London, 1s. 0½d. to 1s. 1d.; North 1s. to 1s. 0½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 11d. to 11½d.; North, 10½d. to 11d. Crude naphtha, in bulk, London, 5½d. to 6d.; North, 5d. to 5½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d.; North, 11½d. to 1s. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3½d. to 3⅝d.; North, 2⅞d. to 3d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 4d. to 1s. 5d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This market has been decidedly quiet during the past week, and the price has dropped considerably. Outside London makes to-day are quoted at £12 15s.; Leith, £13 5s. to £13 6s. 3d.; Hull, £13 3s. 9d.; Liverpool, £13 3s. 9d. to £13 5s.; Middlesbrough, £13 3s. 9d.

COAL TRADE REPORTS.

Northern Coal Trade.

As usual before the holidays, the demand for coal is full, and the prices are generally firm. In the steam coal trade, the Baltic shipments are now in active swing, and prices are very strongly held—best Northumbrian steams being from 16s. 9d. to 17s. per ton f.o.b. for early delivery. Second-class steams are about 15s. 6d. per ton; and steam smalls are rather scarce, and are quoted from near 11s. 3d. to 12s. 6d. per ton f.o.b.—an increased price which is high to that of other qualities. The gas coal trade is brisk for this season of the year. There are full exports; while the large addition to the wages of the Durham miners under the Conciliation Board's award must tend to stiffen prices. Best Durham gas coals may be quoted at 16s. to 16s. 3d. per ton f.o.b.; second-class at 15s. 3d.; and "Wear specials" at 16s. 3d. per ton f.o.b. The contracts for the Newcastle and Gateshead Gas Company are now being arranged; and the price may be taken as about 13s. 4d. per ton, which is (as indicated last week) an advance—possibly of about 2s. per ton. Some sales of gas coal have also been made for the St. Petersburg Municipality, delivery over the Baltic season; and for good Durham gas coals, about 14s. per ton f.o.b. is believed to be near the prices settled at. There are also some sales and cargoes for Genoa; but the prices in these instances are obscured by the varying freights. The gas coke trade is steady, with fair exports from the River Tyne.

Scotch Coal Trade.

Activity in all departments, with firmness of prices, is the characteristic of the Scotch coal trade during the present week. The approximate prices quoted on the Glasgow Coal Exchange were: Steam coal, 13s. 6d. to 14s.; splint, 14s. 9d. to 15s. 3d.; ell, 13s. 9d. to 14s. 3d.; trebles and doubles, 13s. 3d. to 13s. 9d.; and singles, 13s. to 13s. 3d. f.o.b. Glasgow.

Barrow New Gas-Works Scheme.—The Barrow Town Council have approved a scheme to build supplementary gas-works at a cost of £65,000. This will include the purchase from the Furness Railway Company of 5½ acres of land, costing £2500.

Gas Companies and Electric Lighting.—Anticipating the desires of the townspeople, the Leyburn Gas Company are putting down an electric supply plant, and will shortly be in a position to supply electric energy. Overhead lighting conductors will be used.

Ashburton Gas-Works.—The annual statement on the working of the gas undertaking, which was presented to the Ashburton District Council at the last meeting, showed that 2,618,000 cubic feet of gas had been sold, and £691 received; this being £61 more than last year. The unaccounted-for gas was 16·3 per cent. It was explained that this was not all leakage; part of it being due to consumption at the works, and part to under-estimating the quantity of gas used for public purposes. It was decided to instal automatic controllers for certain lights in the town, including a public clock.

Birmingham Gas and Electricity Departments.—In connection with a large electricity works extension scheme which was under consideration by the Birmingham City Council last week, Mr. Ellaway (the Chairman of the Electric Supply Committee) said they were satisfied that a steam-turbine plant would be more economical than a gas-driven electric plant. Mr. Marks thought the Committee's report would have been of a very different character if the Gas Department had helped them in the matter. It would have been much better if the two undertakings could have worked side by side, instead of opposing each other at every opportunity. Replying to this remark, Alderman Sir Hallewell Rogers (the Chairman of the Gas Committee) said it was true there was competition between the Electricity and Gas Departments, but it was friendly competition, and in the interests of the city. The Electricity Department did approach the Gas Department with regard to a price for gas; and the lowest price possible was quoted. This was 1s. per 1000 cubic feet, less 5 per cent., as against the 6d. which was mentioned by the other Committee. The lowest possible price was quoted; and he did not see why the Gas Department should be at a loss in order to serve the Electricity Department. It was not fair to say they had not tried to help the Electricity Department.

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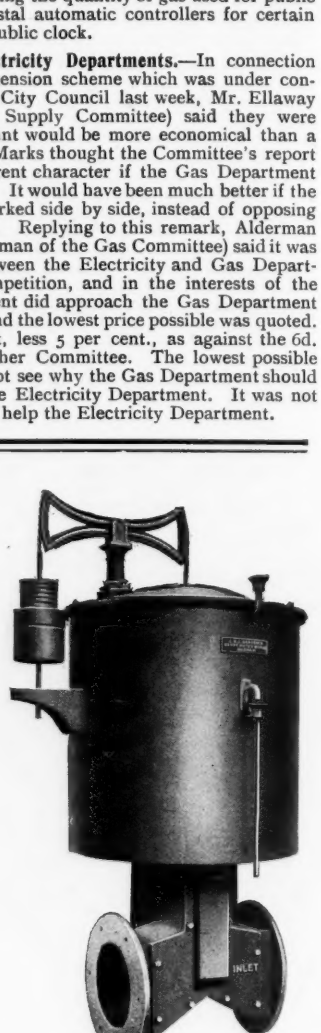

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New Issues of Capital.

The sale conducted at the Mart, Tokenhouse Yard, E.C., last Tuesday, by Messrs. A. & W. Richards, consisted entirely of new issues of capital by order of Directors. The first lots were £5000 of ordinary stock of the Sutton (Surrey) Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, similar stock now receiving 6 per cent.; and it was sold at from £118 15s. to £119 10s. per £100. An issue of 4 per cent. perpetual debenture stock of the Great Yarmouth Water Company was placed at par; and some new ordinary stock, ranking for 7 per cent. maximum dividend, but carrying 4 per cent. as from the 16th inst., fetched from £88 to £90 per cent. A parcel of additional consolidated ordinary "A" 5 per cent. stock of the Bognor Gas Company, carrying 5¾ per cent. from the 1st prox., fetched from £105 to £105 10s. per cent. The last lots were some new ordinary £10 shares in the Ascot District Gas and Electricity Company, ranking for a maximum dividend of 7 per cent., but carrying 6 per cent. from the 15th inst.; and they were sold at from £10 10s. to £11 per share.

The Water Divining Experiments at Guildford.

The Committee appointed to observe the trials of water divining organized by the "Sanitary Record and Municipal Engineering" at Guildford at the beginning of last month have issued their report. Three sites were selected for the experiments. The first, which is crossed by a sewer, consisted of a bed of gravel overlying the London clay; the second forms the top of a small covered reservoir, the water from which was being intentionally run off; while in the third there is a sewer, and also a spring which, when it was discovered a few years ago, was yielding about 50,000 gallons an hour. The conclusions of the Committee, after comparing the state of facts known to exist with the indications of the diviners, are that, whatever sensitiveness to underground water may exist in certain persons, it is not sufficiently definite and trustworthy to be of practical value; and that the lack of agreement with each other shows that it is more a matter of personal mentality than any direct influence of the water. The Committee remark that diviners, as a rule, confine their attention to small streams of water, and as there are few places where these cannot be found, they may well show a large percentage of success.

Tottenham Gas Company and Electric Lighting.

By far the most important development which has marked the fight between the Tottenham and Edmonton Gas Company and the North Metropolitan Electric Power Supply Company to obtain powers to supply the district of Wood Green with electric light, has now taken place. The effect of it is that the Gas Company have succeeded in vanquishing the principal opposition. Mr. W. P. Harding, the Clerk to the Wood Green District Council, informs a local correspondent that the position of the Electrical Power Supply Company has been this: The Company, being unable to apply for a Provisional Order, a new Company, called the "Distribution Company," was formed for the purpose. Before the recent Board of Trade inquiry, which resulted in the Board's refusal of the application of the Company to dispense with the consent of the District Council, the Council objected to the *locus* of either the "Supply" or "Distribution" Company. The application having been refused the Distribution Company, their *locus* to oppose the Gas Company's Bill fell to the ground. A short time ago, as recorded in the "JOURNAL" last week, the Court of Referees heard objections of the Gas Company to the *locus* of the Supply Company; and the Gas Company were successful. There is consequently every reason to believe that the Bill will go through unopposed.

Carnarvon Corporation Gas Supply.—The working of the gas undertaking at Carnarvon has been a success—the net profit for the past financial year being £529. It has been decided to apply £550 in relief of the district rates; and an advance of £25 per annum has been granted to the Engineer and Manager (Mr. W. M. Ruxton) as a mark of appreciation of his services.

Gas and Electricity at Bangor.—Reference was made, in the Bangor City Council, to the report of Mr. P. F. White, the Manager of the gas and electricity works. Alderman Bayne said there was a profit on the gas-works of £326, and a loss of £624 on the electricity works. He suggested that the only "way out" of this deficit was an increase in the price per unit. Mr. Vincent hoped this idea would be favourably considered, for a large part of the electricity deficiency was paid by the gas consumers, who were chiefly the poorer class of the community.

Yeovil Gas Supply.—The accounts of the Yeovil Corporation gas undertaking for the year ended the 31st of March show that the sale of gas produced a revenue of £12,213, while residuals brought in £3,511. The total revenue was £17,403, and the expenditure £12,074; leaving a balance of £5329. After paying interest and other charges, there was left a balance of £580. According to the working statement, 7020 tons of coal were carbonized, and 83,347,000 cubic feet of gas made, of which 70,455,000 cubic feet were sold by meter, 6,600,000 cubic feet were used for street lighting, and 6,292,000 cubic feet were used on the works or were unaccounted for. The make per ton was 11,872 cubic feet, of which 10,976 cubic feet were sold.

Wymondham in Darkness.—The town of Wymondham, in Norfolk, has for the past few weeks been nightly in darkness through the discontinuance of the public lighting. The trouble has arisen over a reduction voted in the lighting estimate for the year. The public lighting of the town is controlled by the parishioners; and they appoint their own lighting inspectors, who submit the estimate. At the annual meeting last December, this was presented; but one of the parishioners moved its reduction, on the ground that it was excessive. The resolution was carried, though it was pointed out that only a shortened period of service could be provided by the lower figure. The Wymondham Gas Company were asked if they could reduce their charge, but they were unable to do so owing to the increased price of coal.

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Water for the South Yorkshire Mining District.—The Leeds Corporation are considering the possibility of arranging a scheme for supplying, out of the great excess of supply over demand which is available in the Leeds Water-Works, the rapidly developing mining townships which are springing up throughout the newly discovered extensions of the South Yorkshire coalfield. It has been suggested that the water supply in these districts is actually decreasing, as the water is drawn away by the boring of the great numbers of pit shafts, and that of the alternative ideas which seem at all acceptable greater favour is given to the provision of water by a large town like Leeds, which has, and will have for many years, plenty to spare, than to the suggestion that the mining townships should combine to provide their own reservoirs and supply. Leeds, it is stated by Alderman Willey, the Chairman of the Water Committee, has "oceans of water to sell," and, needing the extra revenue, is prepared to sell at but the smallest margin of profit. No definite scheme has been evolved; but the authorities in Leeds are hoping that some such arrangement may be come to.

New Filtration Plant for Lancaster.—Last Wednesday, the formal inauguration took place of the new filtration plant which has been installed by the Water Committee of the Lancaster Corporation at Burrow Beck, Scotforth; the function being attended by the Chairman of the Committee (Alderman Huntington), the Mayor (Mr. C. F. Seward), and members of the Corporation, the Borough Surveyor and Water Engineer (Mr. A. G. Bradshaw), and the Contractor (Mr. Bell). Mr. Bell handed to Alderman Huntington a gold key, to mark the occasion; and after the building had been entered, he explained the working of the plant, which consists of twelve mechanical filters in two rows of six. They are steel drums, 8 feet in diameter and 6 ft. 6 in. deep, containing pebble strainers which, while allowing the filtered water free passage, prevent the escape of the filtering material. This rests on the top of the strainers, and consists of about 3 feet of Leighton Buzzard sand. Through this bed the water passes downwards at the rate of 130 gallons per square foot per hour—a maximum of 6500 gallons for each unit, or 75,000 gallons per hour for the whole plant. The power is furnished by a 2¾ H.P. oil-engine. The plant, which has been installed under the supervision of Mr. Bradshaw, has cost about £6000.

Unprofitable Electricity Supply at Redditch.—About a year ago, an Advisory Committee was appointed to investigate and report upon the electricity undertaking of the Redditch Urban District Council; and their report was presented at a Special Meeting of the Council last Wednesday. They attribute the non-success of the undertaking chiefly to the initial mistake in installing a high-tension alternating current system; the defective laying of cables; the inconvenient situation of the works; and the use of a gas plant, which proved a failure. The chief recommendations of the Committee for improving the position of the undertaking were: That £10,000, representing "scrapped" plant, and being therefore unremunerative capital, be reckoned as lost; that a new works manager be appointed, at a commencing salary of £250 per annum; that the charge per lamp for public lighting be increased; that the scale of charges for current for heating and cooking purposes be revised and made more attractive to customers; that a tariff lighting rate be adopted in place of the existing flat-rate scale; that a sliding-scale be adopted for current supplied to factories and works; and that in future the keeping of the books in connection with the department be placed in the charge of the Clerk of the Council The recommendation in regard to the works manager was altered by the substitution of £300 for £250, and adopted.

Application is to be made by the Doncaster Town Council for sanction to borrow £7535 for the purpose of establishing a house-to-house water supply for Adwick-le-Street—a village within the township district.

The mystery which has for some weeks prevailed concerning the whereabouts of Mr. S. H. Danteth, who was associated with the Richmond Gas Stove and Meter Company, at Warrington, has been solved by the discovery of his body in the Ship Canal, Runcorn, on Sunday, the 4th inst. Deceased left his home on the 7th of April, apparently to go to business; but he did not reach the works, and was not afterwards seen or heard of. At the inquiry into the circumstances attending Mr. Danteth's death, no reason was revealed for the fatality; and a verdict of "Found drowned" was returned.

GAS COMPANIES' STOCK AND SHARE LIST.

Another abbreviated week for the Stock Exchange—truncated this time instead of bisected—the House being closed on Saturday as an *avant courier* of the Whitsuntide holidays. Thus circumscribed, business never attained a full-blooded tide; and the pulse of the markets was but moderately accelerated even when the long-desired certainty was attained, and it was no longer a mere rumour that Montenegro had agreed to recognize that the necessities of Europe were stronger than abstract equity. Markets did advance their prices, certainly, but by steps and in moderation, and not by leaps and bounds. The fuller effect may perhaps show itself not long hence. The opening on Monday was quite hopeful on outward visible signs regarding a Scutari settlement; and prices cheered up accordingly. Then doubts arose and administered somewhat of a check. But when official confirmation appeared, the upward movement went on again smoothly. Consols gained ¼, Rails made some moderate advances, and Americans participated. Tuesday opened in similar mood, and prices still advanced; but some realizing later checked progress, and the last figures were not the best. However, Government issues were in good demand, and Consols rose ⅛. Rails were strong and active, and closed above opening figures. Americans were higher. Business was growing very quiet on Wednesday at the approach of the holidays, and things inclined to be dull. Some recovered partially, but most closed at a fall. Consols did not move, Rails zig-zagged unevenly, and Americans were quite flat. The tendency on Thursday was much the same; markets subsiding into inaction and showing symptoms of decline for lack of support. Consols held on; but Rails were irregular, and Americans weaker. Friday finished the week. Of course, business was quiet, but the tone was fairly firm nevertheless. Rails, indeed, were rather better, and Americans less weak. Consols closed at 75 to 75¼—a rise of ⅛ in the week. In the Money Market, the supply was ample and rates became easier. Business in the Gas Market was only moderate, though a good variety of undertakings were dealt in, and the general tone was firm. In Gaslight and Coke issues, the ordinary was steady, realizing from 102¾ to 103½. In the secured issues, the maximum changed hands at 81, and the preference was active at 95 to 96—a fall of 1. South Metropolitan was about the same as last week; being dealt in at 110½ to 111½. The debenture made 74. In Commercials, there were several bargains in the 4 per cent. at 105½ to 106¾. Among the Suburban and Provincial group, British fetched 45⅛ to 45⅝, South Suburban 117½, and, on the local Exchange, Newcastle 99. In the Continental companies, Imperial realized 174⅛ and 175, Union 82⅛ (a fall of 1), European 17⅝ to 18, and Tuscan debenture 96½. Among the undertakings of the remoter world, Bombay was done at 6½, Malta at 4¾ and 5, Melbourne at 99, Monte Video at 12⅝ and 13, Ottoman at 8⅜, Primitiva at 6 7/16 and 6¾ (a fall of ⅛), and ditto preference at 4 15/16 and 5 1/16—a fall of 1/16.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 11	5	Alliance & Dublin Ord.	73—76	..	6 11 7
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	84—87	..	4 12 0
280,000	5	April 11	7½	Bombay, Ltd.	6¼—6⅝	..	5 11 1
50,000	10	Feb. 27	15	Bourne- mouth Gas 10 p.c.	28½—29½	..	5 1 8
332,000	10	,,	7	mouth Gas B 7 p.c.	15⅞—16¼	..	4 6 8
75,000	10	,,	6	and Water Pref. 6 p.c.	13⅞—14¼	..	4 4 3
880,000	Stk.	Feb. 27	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	200—205	..	5 7 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	206—211	..	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.	151—154	..	5 3 11
530,000	20	Mar. 28	12½	British	45—46	..	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	89—91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	91½—93½	..	4 5 7
100,000	10	,,	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	109½—111½	..	4 9 8
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	105—107	..	5 2 1
660,000	,,	,,	5½	Do. 3½ p.c. do.	102—104	..	5 2 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	82—85	−1	4 14 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—132	..	5 6 1
492,270	Stk.	—	5⅜	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.	17½—18½	..	5 8 1
16,415,840	Stk.	Feb. 13	4/17/4	Gas- light & Coke	4 p.c. Ord.	102—104	..	4 13 9
2,600,000	,,	,,	3½		3½ p.c. max.	80—83	..	4 4 4
4,062,235	,,	,,	4		4 p.c. Con. Pref.	94—97	−1	4 2 6
4,674,850	,,	Dec. 12	3		3 p.c. Con. Deb.	73—75	..	4 0 0
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.		89—91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.		—	..	—
70,000	10	April 25	11	Hongkong & China, Ltd.		16½—17*	..	6 9 5
131,000	Stk.	Mar. 13	7½	Ilford A and C		152—155	..	4 18 4
65,780	,,	,,	6½	Do. B		120—122	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.		89—91	..	4 7 11
4,940,000	Stk.	Nov. 14	9	Imperial Continental		172—175	..	5 2 10
1,235,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.		85—87	..	4 0 6
200,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.		120—123	..	4 17 7
561,000	Stk.	Feb. 27	10	Liverpool United A		212—214	..	4 13 6
718,100	,,	,,	7	Do. B		151—153	..	4 11 6
306,083	,,	Dec. 30	4	Do. Deb. Stk.		98—100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.		68—70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean		4¼—5	..	6 0 0
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.		98—100	..	4 10 0
541,920	20	Oct. 30	3½	Monte Video, Ltd.		12⅜—13½	..	5 5 8
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.		98½—99½	..	4 10 6
629,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.		85—86	..	4 1 5
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.		13—14	..	5 4 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.		127—132	..	6 1 3
60,000	5	Mar. 28	10	Ottoman, Ltd.		8—8½	..	5 17 8
60,000	50	Feb. 27	13	Portsea, Island B		125—128	..	5 1 7
100,000	50	,,	12	Do. C		122—125	..	4 16 0
249,980	5	Oct. 11	8	Primitiva Ord.		6⅜—7⅛	−⅛	5 16 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.		4⅛—5⅛	−1/16	4 17 7
521,600	100	Dec. 2	4	,, 4 p.c. Deb.		95—97	..	4 1 8
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.		92—94	..	4 5 1
275,000	5	Apl. 11	12	San Paulo, Ltd.		—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.		11¼—11⅝	..	5 2 2
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.		49—51	..	4 18 0
185,000	Stk.	Mar. 13	10	Sheffield A		225—227	..	4 8 1
209,984	,,	,,	10	Do. B		225—227	..	4 8 1
523,500	,,	,,	10	Do. C		225—227	..	4 8 1
90,000	10	Sept. 27	7½	South African		10—11	..	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.		110—112	..	4 17 7
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.		73—75	..	4 0 0
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.		161—163	..	5 4 4
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.		117—119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.		116—117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.		117—119	..	4 4 0
594,740	Stk.	Nov. 14	5	Southampton Ord.		102—105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham A 5 p.c.		139—142	..	5 2 1
483,940	,,	,,	5½	and B 3½ p.c.		115—117	..	4 18 3
149,470	,,	Dec. 30	4	Edmonton 4 p.c. Deb.		92—94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.		5—6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		96—98	..	5 2 0
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.		115—116	..	4 6 2
255,636	Stk.	Mar. 13	6⅔	Wands- B 3½ p.c.		137—140	..	4 18 2
88,416	,,	Dec. 30	3	worth 3 p.c. Deb. Stk.		68—70	..	4 5 9

Prices Marked * are "Ex. Div."

The Leatherhead Gas and Lighting Company and the Highbridge (Somerset) Gas Company, Limited, have placed with Messrs. A. H. Ball and Co., of Farnham, contracts for laying steel mains for high-pressure gas supply.

Messrs. O. Ellefsen and Co., of Bedford, have sent us a copy of a booklet they have issued describing their new patent low-water alarm and feed regulator for steam-boilers. The makers claim for the appliance that it is reliable, economical, and completely automatic in action.

At the Hampstead Garden Suburb, on the 3rd inst., an interesting procession, organised by the workmen of the Garden Suburb Builders, Limited, perambulated the district, showing, in a series of tableaux drawn on decorated lorries, the development of an estate from the ordinary land to the completed suburb. One of the most attractive displays was that made possible by the help of the Gaslight and Coke Company, whose officials had arranged a car on which were displayed the many adaptations of gas to domestic purposes.

Attention is drawn by Messrs. Isaac Storey and Sons, Limited, of the Empress Foundry, Cornbrook, Manchester, to a new catalogue dealing with Scott patent air-compressors. Illustrated particulars are given of the apparatus; and it is remarked that from these it will be seen that the Scott compressor "has been carefully designed with a view to obviating the many known defects existing in practically all compressors at present on the market, while at the same time many new and strikingly original features have been introduced." The importance of reliable valves has been recognized; and the introduction of the Scott patent ball-valves has, it is claimed, removed valve troubles. For the purpose of classification, the compressors have been divided into two groups—the simple single stage type for belt, rope, or motor drive, and the steam, motor, or belt-driven series intercooling type. The former type (applicable to the smaller sizes) is of extreme simplicity; and the latter, while also simple, contains all the points necessary to give the highest efficiency, both volumetric and mechanical, obtainable in any of the larger makes of compressors.

APPLICATIONS FOR LETTERS PATENT.

9890.—Fricker, E. H., "Gas-fires." April 28.
9902.—Firth Blakeley, Sons, and Co., Ltd., and Wright, J. W., "Gas-stoves." April 28.
9903.—Rose, A., and Bellamy, W., "Gas-regulators." April 28.
9911.—Milne, J. R., and Goad, F. L., "Mixing gas and air." April 28.
9912.—Milne, J. R., and Goad, F. L., "Nozzle for high-pressure lamps." April 28.
9928.—Barrett, S. R., and Yates, H. J., "Gas-fires." April 28.
9941.—Mayweg, H., "Making metal pipes." April 28.
9961.—Woodall, H. W., and Duckham, A. M'D., "Production of coke in gas-retorts." April 28.
9988.—Lewes, V. B., "Carbonization of coal." April 28.
9991.—Lattig, J. W., "Gaseous fuel mixtures." April 28.
9997.—Fottinger, H., "Gas-turbine plant." April 29.
10,066.—Williams, P. E., "Washing or scrubbing gas." April 29.
10,107.—Booth, J., "Lighting appliances." April 30.
10,156.—Robinson, H. W., "Treatment of coal tar." April 30.
10,166.—Ostrorog, Count S. J., "Controlling gas." April 30.
10,269.—Anthony, E., and Davies, A. J., "Recording the cash deposited in an automatic gas-meter." May 1.
10,294.—Gunning, J., "Bye-pass burners." May 1.
10,305.—Biddlecombe, F. G. L., "Production of gas." May 1.
10,381.—Frost, A. C., and Wright, A. C., "Gas-lighting apparatus." May 2.
10,424.—Toogood, H. J., and Dempster, R., and Sons, Ltd., "Vertical retorts." May 3.

Matthew's Patent Gas and Coal Stove Syndicate, Limited, has been registered with a capital of £2000, in £1 shares.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Works Engineer (South of Europe). No. 5733.

Appointments Wanted.

Plumber and Leadburner. No. 5734.

Plant, &c (Second-Hand), Wanted.

Engine and Exhauster, Washer, Tower Scrubber, and Purifiers. No. 5735.

Plant, &c. (Second-Hand), For Sale.

Gas Plant. Tawe Valley Gas Company.
Purifiers, &c. No. 5732.

Patent Licences, &c.

Washing and Cooling Gas. Cruikshank and Fairweather, 65-66, Chancery Lane, W.C.

Stocks and Shares.

Barnet Gas and Water Company. London Mart. June 3.
Cleethorpes Gas Company. Yarborough Hotel, Grimsby. May 23.
East Grinstead Gas and Water Company. London Mart. June 3.
Hythe and Sandgate Gas Company. London Mart. June 3.
Southend Water Company. London Mart. May 20.
Tendring Hundred Water Company. London Mart. June 3.
Wandsworth, &c., Gas Company. London Mart. May 20.
West's Gas Improvement Company. No. 5730.

Meeting.

South Barracas Gas Company. No. 1, East India Avenue, E.C. May 22, 12.30 o'clock.

TENDERS FOR

Benzol.

Warrington Gas Department. Tenders by May 21.

Brass Goods, Cocks, Pendants, Brackets, &c.

Devonport Gas Department. Tenders by May 31.

Bye-Products.

Warrington Gas Department. Tenders by May 21.

Coal.

Barrow Corporation. Tenders by May 30.
Bridgnorth Gas Department. Tenders by May 17.
Evesham Gas Department. Tenders by May 29.
Farnworth and Kearsley Gas Company. Tenders by May 21.
Gainsborough Gas Department. Tenders by May 24.
Leigh (Lancs.) Gas and Water Department. Tenders by May 17.
Mansfield Gas Department. Tenders by May 21.
Marple Gas Department. Tenders by May 26.
Middleton Corporation. Tenders by May 28.
Newry Urban District Council. Tenders by May 23.
Newtownards Gas Department. Tenders by May 27.
Omagh Gas Department. Tenders by May 28.
Rochester, &c., Gas Company. Tenders by May 21.
Skipton Gas Department. Tenders by May 31.
Smethwick Gas Department. Tenders by May 22.
Tiverton Town Council. Tenders by May 30.
Warrington Gas Department. Tenders by May 21.
Wellington (Salop) Gas Company. Tenders by May 24.
Wrexham Gas Company. Tenders by June 4.

Cookers, Fires, &c.

Devonport Gas Department. Tenders by May 31.
Warrington Gas Department. Tenders by May 21.

Fire Clay Goods.

Warrington Gas Department. Tenders by May 21.

General Stores (Glass, Iron and Steel, Lead, Lead Piping, Flexible Tube, Vitriol, Drysaltery, Lime, Cement, Ironmongery, Castings, Oils and Paints, Taps and Valves, Bricks, Sulphuric Acid, &c.).

Devonport Gas Department. Tenders by May 31.
Leigh Gas and Water Department. Tenders by May 17.
Mansfield Gas Department. Tenders by May 21.
Skipton Urban District Council. Tenders by May 31.
Tyldesley Urban Council. Tenders by May 24.
Warrington Gas Department. Tenders by May 21.

Lamps, Gas-Fittings, &c.

Warrington Gas Department. Tenders by May 21.

Meters.

Devonport Gas Department. Tenders by May 31.
Tyldesley Urban Council. Tenders by May 24.
Warrington Gas Department. Tenders by May 21.

Oxide.

Devonport Gas Department. Tenders by May 17.

Pipes, &c.

Leeds Gas Department. Tenders by May 24.
Leigh Gas and Water Department. Tenders by May 17.
Tyldesley Urban Council. Tenders by May 24.
Warrington Gas Department. Tenders by May 21.

Retorts (Re-Setting).

Devonport Gas Department. Tenders by May 23.

Stoking Machine.

Devonport Gas Department. Tenders by May 23.

Tar and Liquor.

Gainsborough Gas Department. Tenders by May 24.
Mansfield Gas Department. Tenders by May 21.

Telpher.

Devonport Gas Department. Tenders by May 23.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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See Illustrated Advertisement, April 8, p. 71.

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